

# A synopsis of *Senna* ser. *Bacillares* (Leguminosae, Caesalpinioideae, Cassieae) in Brazil, including a remarkable new species from Amazonia

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## Abstract

*Senna* (Leguminosae, Cassieae) comprises ca. 300 species mainly distributed throughout the Americas. Although the genus is speciose and taxonomically problematic, very few studies have addressed the systematics of *Senna* in recent years, and many taxonomic and nomenclatural issues remain unresolved. *Senna* sect. *Chamaefistula* ser. *Bacillares* is the most speciose of the American series of *Senna* and is the most problematic series in the genus. Based on fieldwork and extensive analysis of herbarium collections, we document the occurrence of 29 species of *Senna* ser. *Bacillares* in Brazil. This total includes *Senna rionegrensis*, which is newly described from Amazonia and distinguished by its short abaxial stamens. We provide a synoptical treatment of the taxa of *Senna* ser. *Bacillares* occurring in Brazil, including identification keys, short morphological descriptions, taxonomic notes, and distributional and phenological data. This work contributes to the taxonomic knowledge of *Senna* ser. *Bacillares* in Brazil and serves as a baseline for our ongoing taxonomic revision.

**Keywords** Caesalpinioideae · Cassieae · Fabaceae · new species · new occurrences · taxonomy

## Introduction

*Senna* Mill. (Leguminosae, Caesalpinioideae, Cassieae) comprises ca. 300 species distributed predominantly in the American continent and to a lesser extent in Africa, Asia, and Australia (Irwin & Barneby, 1982; Lewis et al., 2005; Rando et al., 2024). Miller (1754) published the genus, only one year after Linnaeus (1753) published his genus *Cassia*, with which it has been closely associated. The name *Senna*

derives from the Arabic “sana” or “sanna” in reference to medicinal plants with purgative and laxative properties (Miller, 1754; Lewis, 2005).

Historically, most authors have recognized *Senna* as a synonym of *Cassia* (e.g., De Candolle, 1825; Vogel, 1837; Bentham, 1871; Irwin & Turner, 1960). More than two centuries after Miller (1754), Irwin and Barneby (1981, 1982) reestablished the genera *Chamaecrista*, originally described by Moench (1794), and *Senna*, thereby greatly reducing the circumscription of *Cassia*. They recognized these three genera as morphologically distinct yet closely related within the subtribe Cassiinae. However, more recent phylogenetic studies have found that these genera do not form a monophyletic group (Bruneau et al., 2008; Bruneau et al., 2024). Although *Cassia* is sister to *Senna*, *Chamaecrista* is more closely related to other genera including *Batesia*, *Melanoxylon* and *Recordoxylon* (Rando et al., 2024).

In their treatments of American *Senna*, Irwin and Barneby (1981, 1982) recognized six sections and 35 series within the genus. In the following years, regional revisions were published for the species of *Senna* in Australia, Africa and Asia (Randell, 1988, 1989, 1990; Randell & Barlow, 1998; Singh, 2001), which included new combinations, descriptions of new taxa, and the recognition of three more series. Phylogenetic

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studies based on morphological and molecular data have supported the monophyly of *Senna* (Bruneau et al., 2001; Herendeen et al., 2003; Marazzi et al., 2006a), but five of the six sections recognized by Irwin and Barneby (1982), including *Senna* sect. *Chamaefistula*, appear to be non-monophyletic (Marazzi et al., 2006a; Marazzi & Sanderson, 2010). However, the monophyly of *Senna* sect. *Chamaefistula* ser. *Bacillares* (Benth.) H.S. Irwin & Barneby was supported.

*Senna* ser. *Bacillares* comprises approximately 50 species restricted to tropical and subtropical areas of the Americas. Its species occur in different vegetation types, such as savanna, seasonal forest, and ombrophilous forest, especially in forest edges (Irwin & Barneby, 1982). Subsequent to the publication of Irwin and Barneby's (1982) treatment only a few taxonomic studies have focused on the *Senna* ser. *Bacillares*. These include the descriptions of new species from Peru (Barneby, 1992), Bolivia (Nee & Barneby, 1993), Mexico (Rojas-Martínez et al., 2019) and Brazil (Lima et al., 2021, 2023), and one new combination (Silverstone-Sopkin, 2012).

In Brazil, *Senna* is represented by 89 species (Bortoluzzi et al., 2020), and our recent taxonomic studies on different series within *Senna* indicate a growing number of species being documented for the country (Lima et al., 2024a; Lima et al., 2024b). Here, we provide a synoptical treatment of the species and varieties of *Senna* ser. *Bacillares* that occur in Brazil. The treatment is based on extensive fieldwork and collections-based research, and includes identification keys, short descriptions, geographical and phenological data, and discussions of diagnostic characters and comparison with similar species. This manuscript will serve as a baseline for an ongoing taxonomic revision.

## Materials & Methods

This work is based on field expeditions to observe taxa in their natural habitats and on specimens from herbaria with important collections from Brazil: ALCB, B, BHCb, BR, CEN, CESJ, CEPEC, CVRD, ESA, F, FLOR, HUEFS, HUTO, IAN, INPA, K, MAC, MBM, MBML, MG, MO, NY, P, R, RB, RON, SP, SPF, UB, UEC, UFG, VIC, VIES (acronyms according to Thiers, [continually updated](#)). Morphological terms used in the taxonomic treatment follow Irwin and Barneby (1982) and Harris and Harris (2001) for habit, indumentum, leaves, flowers, and fruits, LAWG (1999) for leaflet venation, and Weberling (1989) for inflorescence morphology. A preliminary species conservation assessment for the new species was performed based on the IUCN Red List categories and criteria (IUCN, 2024). Area of Occupancy and Extent of Occurrence were calculated using the Geospatial Conservation Assessment Tool (GEOCAT, Bachman et al., 2011).

## Results & Discussion

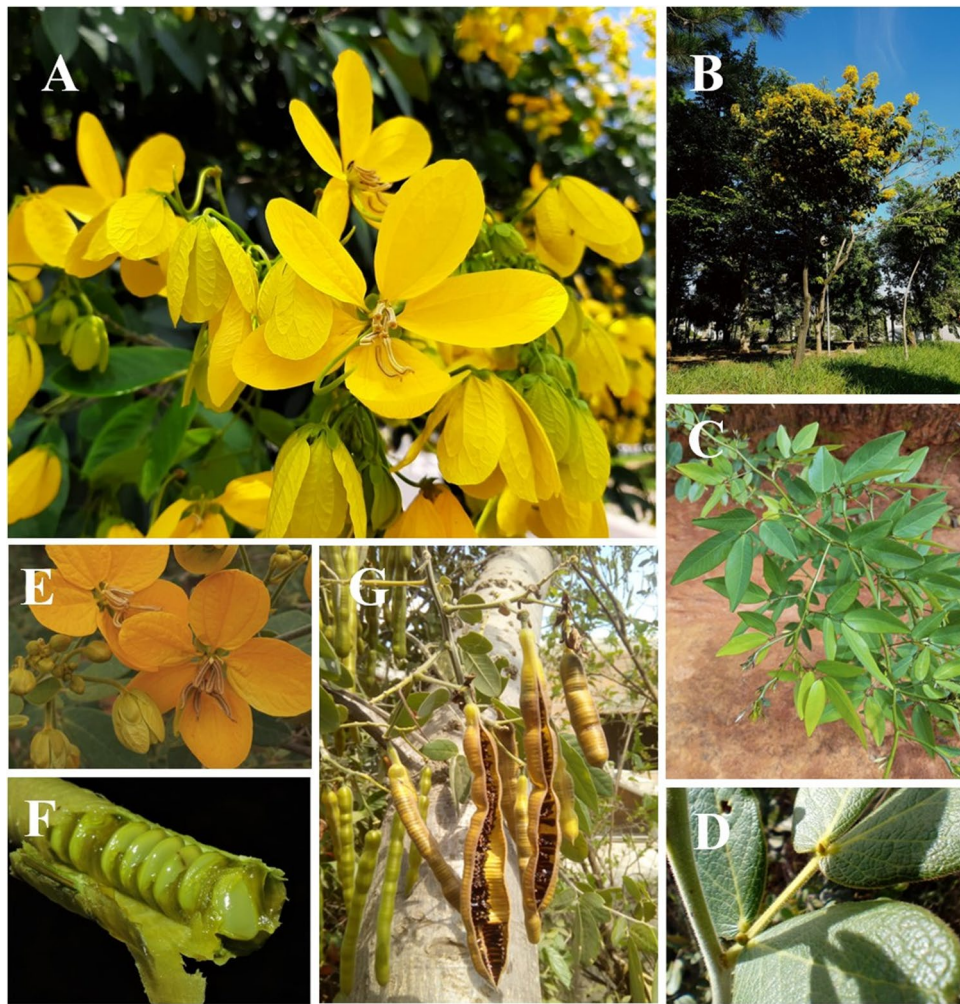
We recorded 29 species of *Senna* ser. *Bacillares* in Brazil, distributed throughout the country, although mainly in the Brazilian Atlantic Forest and Amazonia. Species occupy various vegetation types but are most prevalent in forest ecotones in moist environments. *Senna herzogii* (Harms) H.S. Irwin & Barneby is recorded as a new occurrence record for Brazil, and *Senna rionegrensis* is newly described and illustrated.

### Morphology

**Leaves.** Leaves with two pairs of leaflets is a diagnostic feature of *Senna* ser. *Bacillares* (Fig. 1); however, we rarely observed three pairs of leaflets in *S. subtrijuga* (Belém 3312) and *S. splendida* (Siqueira 107), but this variation seems to be of no taxonomic significance. Leaflet laminae can be symmetric with the midrib positioned centrally (e.g., in *S. acutisepala* and *S. georgica*) or asymmetric with the midrib laterally displaced (e.g., in *S. chrysocarpa* and *S. rizzinii*); lamina shape varies from elliptic to lanceolate, obovate, oblong, orbicular, ovate, or reniform. In general, the secondary venation pattern in the taxa of *Senna* ser. *Bacillares* is brochidodromous—with variations in the divergence angle and the spacing between the secondary veins—except in *S. gardneri*, in which it is craspedodromous (Lima et al. 2021). The appendage at the apex of the leaf rachis can be caducous or persistent; its shape varies from setaceous to filiform, curved, hooked, or horn-shaped (e.g., *S. cornigera*).

Extra-floral nectaries in *Senna*, when present, secrete nectar from a convex surface (Irwin & Barneby, 1982), the secretions serving as food for ants (Marazzi et al., 2006a, b). Molecular dating analyses indicate that *Senna* evolved in the early Eocene, while lineages with extra-floral nectaries present originated in the late Eocene, after a major radiation of ants (Marazzi & Sanderson, 2010). The extra-floral nectary is considered a key innovation in plant defense that might have allowed a large diversification in *Senna*, as well as the colonization of a large variety of habitats (Marazzi et al., 2006a, b; Marazzi & Sanderson, 2010).

In *Senna* ser. *Bacillares*, extra-floral nectaries are always present and positioned between (or a little above) the pairs of leaflets on the adaxial side (Fig. 1). They may be sessile or stipitate, and their shape ranges from clavate to conical, fusiform, globose, lanceolate, linguiform or ovate. We observed that the number of nectaries on the leaf rachis (either one or two) is a useful character to differentiate species (e.g. one in *S. affinis* vs. two in *S. quinquangulata*), but in other taxa, such as *S. latifolia* and *S. macranthera* var. *micans*, the number may vary on the same individual.



**Fig. 1** A, B. *Senna macranthera*: inflorescence (A); habit (B). C. *Senna splendida*: habit. D, E. *Senna rugosa*: extra-floral nectaries between each pair of leaflets (D); flowers (E). F. *Senna quinqueangulata*: fruit with transversely positioned seeds, uniseriate. G. *Senna angulata*: fruit with follicular dehiscence. [Credits: Alexandre Gibau de Lima (A–E), Rubens Queiroz (F), Franklin Logan (G).]

**Inflorescence and bracts.** Inflorescences are axillary racemes or terminal panicles, or rarely cauliflorous (in *S. ruiziana*). The density of flowers in an inflorescence differentiates some species. For example, the racemes of *S. chrysocarpa* have densely congested flowers, whereas the panicles of *S. quinqueangulata* are laxly flowered. The bracts may be caducous or persistent at anthesis; their size and persistence vary and sometimes serve to differentiate species (e.g., large and persistent in *S. rizzinii* and small and caducous in *S. chrysocarpa*).

**Flowers.** The calyx may be homomorphic (e.g., *S. actutisepala*) or heteromorphic (e.g., *S. georgica*); i.e., with sepals of the same or different shapes and sizes, respectively. Sepal shape varies from oblong to elliptic, cymbiform, oboval, orbicular, oval or lanceolate. The corolla may be bilaterally symmetric or asymmetric (Fig. 1). In the latter, one of the abaxial petals is cucullate

and sometimes partially envelops the abaxial stamens (e.g., *S. pinheiroi*).

The androecium consists of three adaxial staminodes, 4 median stamens, and 3 abaxial stamens (commonly one central and two lateral). Stamen differentiation distinguishes two groups of species: one has the stamens strongly differentiated in length, with the abaxial stamens approximately twice the length of the median ones (e.g., *S. bahiensis*), the second has the stamens of equal length, or sometimes the abaxial stamens a third longer or shorter than the median ones. The anthers are oblong or falcate-oblong, with a beaked apex that varies from truncate, to erect, geniculate, or curved.

The gynoecium may be centrally positioned or laterally displaced (enantiostyly). The ovary is multi-ovulate, often with more than 50 ovules. The style is commonly acute or attenuate, but is clavate with an expanded stigma in *S. latifolia* and *S. quinqueangulata*.



**Fruits.** Fruits are indehiscent or follicular dehiscent (Fig. 1), cylindrical to sub-cylindrical (except in *S. georgica*, which is laterally compressed). The mesocarp is usually pulpy when immature and dry when mature. Fruit length varies from less than 10 cm long to 35–40 cm long. The valves are corrugated, venulose or smooth, and when mature dark green to brown or blackish. The seeds are always transversely positioned and arranged either uniseriately or biseriately (Fig. 1).

## Taxonomic Treatment

*Senna* sect. *Chamaefistula* ser. *Bacillares* (Benth.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 102 (1982). *Cassia* ser. *Bacillares* in Fl. Bras. (Martius) 15(2): 96 (1870). TYPE: *Senna bacillaris* (L.f.) H.S. Irwin & Barneby.

**Description.** Erect or scandent shrubs, vines or trees. Branches cylindrical to angular. Leaves alternate; rachis with 1–2 extra-floral nectaries on the adaxial side, sometimes 1 nectary present on the abaxial side positioned above the distal pair of leaflets, the nectaries sessile or

stipitate, clavate, fusiform, globose, conical, lanceolate, linguiform or ovate; rachis appendage caducous or persistent; leaflets 2 pairs per leaf, lamina symmetric or asymmetric. Inflorescence an axillary raceme or terminal panicle, or sometimes cauliflorous. Flowers with sepals heteromorphic or homomorphic; corolla asymmetric or zygomorphic, the central-adaxial petal commonly larger, oblong, obovate or orbicular, 2 lateral-adaxial petals oblong or obovate, 2 abaxial petals, homomorphic (or sometimes heteromorphic with one petal obovate and the other cucullate); androecium comprising 3 adaxial staminodes, 4 median stamens, and 3 abaxial stamens (one central and two lateral), anthers oblong, straight or curved; gynoecium centrally positioned or laterally displaced (enantiostyly), ovary stipitate, style attenuate or clavate, stigma 0.4–2 mm diam. Fruit indehiscent or with follicular dehiscence, cylindrical to sub-cylindrical (but laterally compressed in *S. georgica*), mesocarp pulpy when immature and dry when mature. Seeds transversely positioned, uni- or biseriate. Chromosome number  $n = 13$  (IPCN, 2022), except in a single accession of *S. rugosa* which was found to be tetraploid with  $n = 28$  (Biondo et al., 2005).

## Key to the Brazilian Species of *Senna* sect. *Chamaefistula* ser. *Bacillares*

1. Leaf rachis with two extra-floral nectaries (on the adaxial side), one between each pair of leaflets.....2.
1. Leaf rachis with only one extra-floral nectary (on the adaxial side), between the proximal pair of leaflets.....9
2. Sets of stamens strongly differentiated in length, abaxial stamens approximately twice longer than the median ones.....3
2. Sets of stamens of equal length or sometimes the abaxial stamens up to a third longer or shorter than the median ones.....5
3. Petiole always shorter than rachis.....1. *S. rugosa*.
3. Petiole always longer than rachis.....4.
4. Sepals heteromorphic; fruits 1–1.5 cm wide.....29. *S. macranthera*.
4. Sepals homomorphic; fruits 0.8–1 cm wide.....2. *S. pinheiroi*.
5. Style clavate; stigma dilated, 1–2 mm diam. ....6.
5. Style cylindrical or attenuate; stigma not dilated, 0.4–0.8 mm diam. ....7.
6. Extra-floral nectaries on leaf rachis ovate; outermost sepal cymbiform, rigid and yellowish (when fresh); petals 2–2.3 cm wide.....3. *S. latifolia*.
6. Extra-floral nectaries on leaf rachis fusiform; outermost sepal ovate, membranaceous and greenish (when fresh); petals 0.6–1.2 cm wide.....4. *S. quinquangulata*.
7. Bracts 8–15 × 3–7 mm, persistent during and after anthesis.....6. *S. undulata*.
7. Bracts 2–5 × 1.8 mm, caducous or sometimes persistent during anthesis only.....8
8. Leaf rachis slightly sulcate, 0.5–0.8 mm wide; extra-floral nectaries stipitate, clavate or fusiform, distal leaflets elliptic to narrowly elliptic, 1.5–2.5 cm wide.....8. *S. rupumuniensis*.
8. Leaf rachis strongly sulcate, 1.5–2 mm wide; extra-floral nectaries sessile, ovate, longer or shorter than the median ones, 4–5 cm wide.....9. *S. subtrijuga*.
9. Sets of stamens of equal length or sometimes the abaxial stamens up to a third longer or shorter than the median ones.....10.
9. Sets of stamens strongly differentiated in length, abaxial stamens approximately twice longer than median ones.....21.
10. Outermost sepal cymbiform, rigid, enclosing the flower bud until just before anthesis; stigma 1–2 mm diam. ....3. *S. latifolia*.
10. Outermost sepal lanceolate, ovate or elliptic, membranaceous, not enclosing the flower bud; stigma 0.5–0.7 mm diam.....11.
11. Leaflet lamina symmetric or sometimes subsymmetric with the midrib centrally positioned.....12.
11. Leaflet lamina asymmetric with the midrib laterally displaced.....13.
12. Leaflet base cuneate, distal leaflets 5–10 × 2–5 cm; sepals lanceolate with acute apex, sepal venation not prominent; fruit valves venulose...10. *S. acutisepala*.
12. Leaflet base obtuse, distal leaflets (12–)15–40 × 7–20 cm; sepals ovate or elliptic with obtuse apex; sepal venation prominent; fruit valves slightly cor rugated.....11. *S. macrophylla*.
13. Inflorescence usually cauliflorous; fruits falcate or cochleate.....12. *S. ruiziana*.
13. Inflorescence axillary or terminal; fruits straight or slightly curved.....14.
14. Stipules foliaceous, 4.5–5.5 × 3.6–4.0 cm.....13. *S. herzogii*.
14. Stipules filiform or oblanceolate, 0.4–2.0 × 0.05–0.3 cm.....15.
15. Distal leaflets 8–23 × 4–10 cm.....16.
15. Distal leaflets 2–7.5 × 1.5–3 cm.....18.
16. Young branches straight or slightly curved; extra-floral nectary fusiform.....5. *S. dryadica*.
16. Young branches fractiflex (zig-zagged); extra-floral nectary ovate.....17.
17. Base of proximal leaflets strongly rounded-truncate; central-adaxial petal orbicular-obovate, 2.5–3.2 × 1.8–2.2 cm; beak of the abaxial anthers with one pore.....14. *S. bacillaris*.

17. Base of proximal leaflets obtuse or slightly rounded; central-adaxial petal obovate-oblong, 1.4–2 × 0.7–1.2 cm; beak of the abaxial anthers with two pores ..... 15. *S. affinis*.
18. Distal leaflets elliptic, 6.5–7.5 cm long; fruits 13–22 cm long ..... 7. *S. rionegrensis*.
18. Distal leaflets ovate-elliptic, 2–4 cm long; fruits 4–8 cm long ..... 19.
19. Bracts 1–3 × 1–2 mm, caducous; longest abaxial petal cucullate; style 2–3.5 mm long ..... 16. *S. chrysocarpa*.
19. Bracts 5–10 × 3–6 mm, persistent; longest abaxial petal obovate; abaxial; style (4.5–) 5–8 mm long ..... 20.
20. Leaves usually with 1 extra-floral nectary; leaflet adaxial surface pubescent or tomentulose ..... 17. *S. rizzinii*.
20. Leaves with 1–2 extra-floral nectaries; leaflet adaxial surface strigose ..... 18. *S. pluribracteata*.
21. Leaflet lamina symmetric or sometimes subsymmetric with the midrib centrally positioned ..... 22.
21. Leaflet lamina asymmetric with the midrib laterally dislocated ..... 27.
22. Petiole 0.8–1.2 cm long; leaf rachis appendage 10–13 mm long, horn-shaped ..... 19. *S. cornigera*.
22. Petiole 2–6 cm long; leaf rachis appendage 2–6 mm long, setaceous, filiform, hook shaped or curved ..... 23.
23. Leaflets obovate or orbicular ..... 24.
23. Leaflets elliptic or ovate ..... 25.
24. Shrub or treelet; young branches and leaflets nigrescent when dry, secondary venation craspedodromous, marginal veins conspicuous; central-adaxial petal 2–2.5 × 1.3–2 cm ..... 20. *S. gardneri*.
24. Scandent shrub to high-climbing vine; young branches gray when dry, leaflets brown when dry, secondary venation brochidodromous, marginal veins inconspicuous; central-adaxial petal 3.3–4 × 2.5–3 cm ..... 21. *S. bahiensis*.
25. Distal leaflets broadly elliptic, 6–10 cm wide; fruits laterally compressed ..... 22. *S. georgica*.
25. Distal leaflets elliptic, 1.5–4 cm wide; fruits cylindrical ..... 26.
26. Flower buds globose; calyx with sepals strongly differentiated in shape and size, the outermost sepal oblong-obovate with a rounded apex ..... 23. *S. splendida*.
26. Flower buds lanceolate; calyx with sepals equal or almost so, the outermost sepal lanceolate with a caudate apex with recurving tip ..... 24. *S. gloriosa*.
27. Young branches quadrangular ..... 28.
27. Young branches cylindrical ..... 29.
28. Bracts sepeloid, 7–14 × 3–6 mm, persistent ..... 25. *S. angulata*.
28. Bracts not sepeloid 2–4 × 1.5–2 mm, caducous ..... 26. *S. tapajozensis*.
29. Inflorescence of axillary racemes immersed in foliage; fruits 0.5–0.8 cm wide ..... 27. *S. tenuifolia*.
29. Inflorescence of exserted panicle or racemes; fruits 1–1.5 cm wide ..... 30.
30. Coriaceous leaflets; golden velutinous fruits ..... 28. *S. franciscana*.
30. Membranaceous leaflets; pubescent or tomentose fruits ..... 29. *S. macranthera*.

1. *Senna rugosa* (G. Don) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 188 (1982). *Cassia rugosa* G. Don, Gen. Hist. 2: 440 (1832). Fig. 2.

**Description.** Erect shrub, 1.5–3 m tall; young branches straight or slightly fractiflex, cylindrical, tomentose. Stipules linear. Leaves with petiole 0.5–1.8 cm long; rachis 2–3.5 cm long; extra-floral nectaries 2, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina asymmetric, elliptic, obovate or ovate, coriaceous, adaxial surface glabrous or sparsely pubescent, abaxial surface tomentose, leaflets of the proximal pair 2.5–4.5 × 2–3.5 cm, leaflets of the distal pair 5–9 × 3–3.4 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves shorter than the racemes; bracts 2–4 × 1–2 mm, cymbiform, caducous. Flowers with sepals heteromorphic, oblong, ovate or obovate; central-adaxial petal 2.5–3.5 × 2–3 cm, oblong-orbicular, two lateral-adaxial petals 2.3–3.5 × 2–2.8 cm, oblong-orbicular, two abaxial petals 2.5–3.5 × 2–3 cm, one obovate and the other slightly cucullate; four median stamens with the filaments ca. 3–4 mm long and anthers 5–8 mm long, three abaxial stamens with filaments 6–10 mm long and anthers 10–12 mm long; ovary sericeous, style glabrescent, stigma 0.2–0.5 mm diam. Fruit with stipe 0.4–1 cm long, body 4–12 × 1.3–2 cm, cylindrical, valves corrugated.

**Representative Specimens Examined.** BRAZIL. Bahia: Senhor do Bonfim, serra de Santana, 12 Jul 2005 (fl.), D. Cardoso et al. 678 (HUEFS); Encruzilhada, ca. 26 km na estrada para Divinópolis, 15 Aug 2001 (fl., fr.), A. M. Carvalho et al. 6957 (ALCB, HUEFS); São Desidério, BR 020 entre

Posse e Barreiras km 50, 15 Jun 1983 (fl., fr.), L. Coradin et al. 5696 (NY); Cocos, Fazenda Trijunção, Ponto 1, solo arenoso-argiloso, relevo levemente ondulado, campo sujo, 15 May 2001 (fl.), M. L. Fonseca et al. 2668 (EAC); Piatã, Chapada Diamantina, Três Morros, 19 Sep 2004 (fr.), M. L. Guedes et al. 11,349 (ALCB); Caetitê, 1.5 km S of Brejinhos das Ametistas, R. M. Harley 21,242 (NY); Lençóis, vicinity of Lençóis, 2–5 km N of Lençóis, on trail to Barro Branco, 11 Jun 1981 (fl.), S. A. Mori & B. M. Boom 14,321 (NY); Seabra, ca. 3 km S de Lagoa do Chure, 22 Jun 1993 (fl., fr.), L. P. Queiroz et al. 3364 (MBM). Ceará: Barbalha, FLONA do Araripe, 02 Aug 2000 (fr.), I. R. Costa & L. W. Lima-Verde 42 (EAC); Viçosa do Ceará, caminho para Vambira, 16 Sep 1988 (fl., fr.), A. Fernandes et al. 15,673 (EAC); Crato, chapada do Araripe, 15 Feb 1985 (fl.), A. H. Gentry et al. 50,159 (NY); Federal District: Brasília, Parque Nacional de Brasília, cascalheira em frente ao Centro de Visitantes, 10 Apr 2016 (fl.), C. R. Martin 2115 (CEN); Brasília, Parque Nacional do Gama, 25 May 1965 (fl.), D. Sucre 302 (NY). Goiás: Cristalina, 35 km by road E of Cristalina, 06 Apr 1973 (fl.), W. R. Anderson 8300 (NY); Alto Paraíso de Goiás, Chapada dos Veadeiros, 10 Feb 1966 (fl., fr.), H. S. Irwin et al. 12,463 (NY); Piranhas, ca. 70 km SE of Aragarças, road to Piranhas, 23 Jun 1966 (fr.), H. S. Irwin 17,659 (NY); Pirenópolis, 20 km NW of Corumbá de Goiás, near Pico dos Pirineus, 26 Jan 1968 (fl.), H. S. Irwin et al. 19,218 (NY); Caldas Novas, Parque Estadual da Serra de Caldas Novas, 30 Jul 2008 (fr.), T. M. Moura et al. 343 (CEN, UEG); Rio Verde, c. 8 km SW of town, 13 Jan 1968 (fl.), D. Philcox 3979 (NY); Aporé, próximo GO 260, Sep 2018 (fl.), L. F. Souza 5849 (HJ); Maranhão: São João dos Patos, BR 230, estrada para Barão do Grajaú, 19 Apr 1980 (fl.), A. Fernandes & E. Nunes s.n. (EAC); Porto Franco, BR010, 11 Dec 1979 (fl.), E. Nunes & P. Martins s.n. (HUEFS). Mato Grosso: Chapada dos Guimarães, 30 Jan 1989 (fl.), M. A. Figueiredo s.n. (EAC); Diamantino, Chapada dos Parecis, 12 May 1995 (fl.), G. Hatschbach et al. 62,671 (MBM); Serra do Roncador, N of Xavantina, 04 Jun 1966 (fl., fr.), H. S. Irwin et al. 16,575 (NY). Mato Grosso do Sul: Bataguacú, near highway BR 257, ca. 58 km W of São Paulo, 06 Feb 1975 (fl.), W. R. Anderson 11,203 (NY); Campo Grande, rio Anhandui, 12 Jul 1969 (fl.), G. Hatschbach & O. Guimarães 22,151 (NY). Minas Gerais: Diamantina, ca. 18 km by road SW of Diamantina on road to Curvelo, Serra do Espinhaço, 10 Apr 1973 (fl., fr.), W. R. Anderson 8475 (NY); São João Batista do Glória, Serra da Canastra, 15 Nov 2011 (fr.), M. F. B. Costa et al. 50 (UEC); São Tomé das Letras, 17 Mar 2012 (fl.), N. A. G.

*Escobar & I. P. Reno* 128 (UEC); Uberlândia, 23 km W de Uberlândia on road to Tupaciguara, 1 Feb 1959 (fl.), *H. S. Irwin* 2529 (NY); Aiuruoca, à beira de mata, 13 Mar 1989 (fl.), *L. Krieger & M. Brugger* 24,487 (MBM); Belo Horizonte, parque da Serra do Curral, trilha ecológica na crista da serra, 1409 m altitude, 25 Apr 2018 (fl.), *A. D. C. Lopes* 201 (BHCB); Rio Pardo de Minas, campo rupestre, 23 May 2005 (fl., fr.), *A. C. Sevilha* et al. 4343 (CEN); Curvelo, 3 Jun 1999 (fr.), *E. Tameirão-Neto* 3029 (MBM). **Pará:** Serra do Cachimbo, BR 163, 22 Feb 1977 (fl.), *J. H. Kirkbride & E. Lleras* 2983 (INPA, NY, US). **Paraná:** Sengés, cerrado, 28 Feb 2007 (fl.), *E. Barbosa & J. M. Silva* 2120 (HUFU); Jaguariáiva, 29 Dec 1992 (fl.), *A. C. Cervi* 4027 (MBM); Campo Mourão, estrada do aeroporto, 3 Feb 1962 (fl.), *G. Hatschbach* 8857 (MBM). **Pernambuco:** Serra do Araripe, 30 Jul 1997 (fl.), *W. W. Thomas* et al. 11,675 (MBM). **Piauí:** Bom Jesus, Serra do Uruaú, 5 Jun 1998 (fl.), *A. Fernandes & E. Nunes s.n.* (EAC); Currais, 5 Jul 2017 (fl.), *G. Viana* 45 (UB). **Rondônia:** Vilhena, cerrado na beira da BR-364, 07 Dec 2013 (fl.), *N. C. Bígio* et al. 1272 (RON); Colorado do Oeste, estrada para Colorado do Oeste, km 25, 07 Jun 1984 (fl., fr.), *C. A. Cid* et al. 4322 (NY). **São Paulo:** Caieiras, 18 Aug 1995 (fr.), *W. Hoehne s.n.* (MBM); Assis, Estação Experimental do Instituto Florestal, 18 Feb 1988 (fl.), *H. F. Leitão-Filho* et al. 20,087 (CEN, UEC); São José dos Campos, córrego da ressaca, 21 Mar 1962 (fl.), *I. Mimura* 320 (US); Porto Ferreira, Parque Estadual de Porto Ferreira, trilha da borda do parque paralela à estrada, 20 May 2010 (fl.), *A. P. C. Oliveira & M. Osasco* 73 (UEC); Votuporanga, 19 Jun 1964 (fl.), *J. M. Pires* 57,920 (NY); Itirapina, Reserva do Instituto Florestal, 14 Feb 1989 (fl.), *L. P. Queiroz* et al. 2283 (HUEFS, MBM); along the S Manuel-Piracicaba highway, near ex-RR Station, "13 de Maio", 16 Apr 1970 (fl., fr.), *I. S. Silberbauer* 106 (NY); Jundiá, Parque do Cerrado, 21 Dec 2016 (fl., fr.), *B. G. Silva & T. P. Pires* 342 (UEC); Botucatu, 18 km N of Botucatu (14 km E of São Manuel); Itararé, estrada Itararé-Itapeva, próximo a ponte do Rio Verde, 18 Aug 1995 (fr.), *V. C. Souza* et al. 8749 (ESA, LUSC). **Tocantins:** Piraquê, cerrado, Apr 2007 (fl.), *J. E. G. Lima* 41 (HUTO); Mateiros, Parque Estadual do Jalapão, margens da TO- 110, 1 Jul 2014 (fl., fr.), *J. A. Lombardi* et al. 10,302 (HRCB, HUEFS); Palmas, sub-bacia do Ribeirão São João, 19 Jun 2006 (fl.), *E. R. Santos & C. B. Pereira* 346 (HUTO).

**Distribution & Habitat.** *Senna rugosa* occurs in Bolivia, Brazil, and Paraguay (Irwin & Barneby, 1982; Marazzi et al., 2006a, b). In Brazil, it can be found in the central-western (Goiás, Mato Grosso do Sul, Mato Grosso, and Federal District), northern (Pará, Rondônia, and Tocantins), north-eastern (Bahia, Ceará, Maranhão, Pernambuco, and Piauí), southeastern (Minas Gerais, and São Paulo) and southern (Paraná) regions, in the Amazon, Atlantic Forest, Caatinga, Cerrado, and Pantanal domains. *Senna rugosa* is a typical species of Brazilian savannas, occurring in grasslands and wooded savanna, and in rupestrian grasslands. Occasionally it is found at the edge of seasonal forests and in riparian vegetation. It occurs from 500 to 1400 m a.s.l.

**Phenology.** Flowering from October to July and fruiting from April to September.

**Notes.** *Senna rugosa* is easily recognized by the petiole always being shorter than the leaf rachis, the presence of two extra-floral nectaries on the rachis, leaflets with conspicuous reticulate venation, large corolla with the petals 2.5–3.5 cm long, and fruits 1.3–2 cm wide. Within *Senna* ser. *Bacillares*, it resembles *S. pinheiroi* and *S. macranthera* in having the stamens strongly differentiated in length. However, it can be distinguished from *S. pinheiroi* by the petiole shorter than the rachis (vs. longer in *S. pinheiroi*), the leaflets coriaceous (vs. chartaceous), the sepals heteromorphic (vs. homomorphic) and the fruits 1.3–2 cm wide (vs. 0.5–0.8 cm). From *S.*

*macranthera*, it can be distinguished by the petiole shorter than the rachis (vs. longer in *S. macranthera*) and the leaf rachis always with two extra-floral nectaries on the adaxial surface (vs. one).

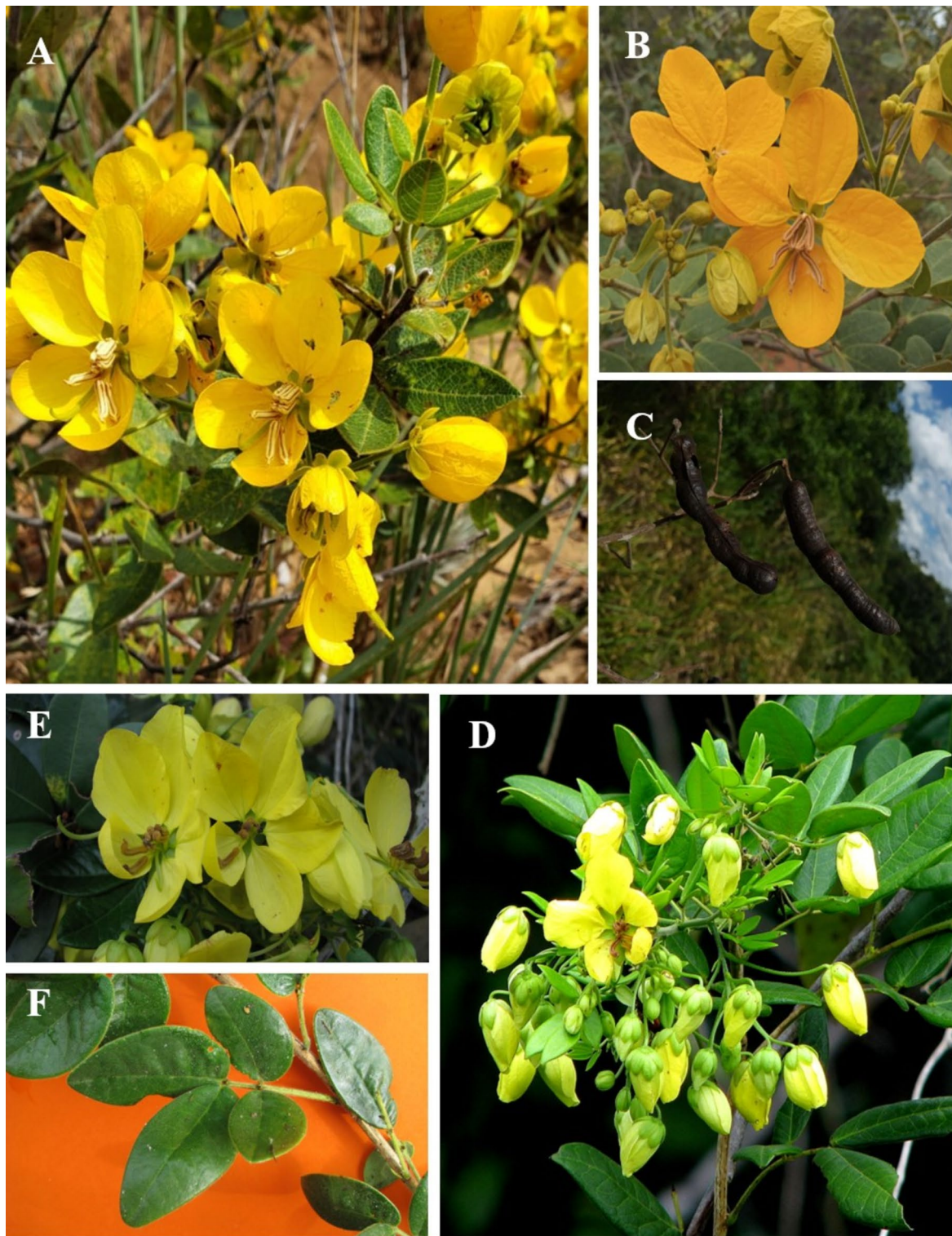
**2. *Senna pinheiroi*** H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 180–181 (1982). Fig. 2.

**Description.** Erect or scandent shrub, 1–3 m tall; young branches slightly curved, cylindrical, tomentose or hirsute. Stipules filiform. Leaves with petiole 2–3.5 cm long; rachis 0.5–1.5 cm long; extra-floral nectaries 2, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina asymmetric, elliptic or ovate, chartaceous, adaxial surface glabrous, abaxial surface tomentose, leaflets of the proximal pair 2.5–5.4 × 2–3.5 cm, leaflets of the distal pair 5–8 × 2.5–4 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves longer than the racemes or equally long; bracts 2.5–4 × 1–2 mm, elliptic, persistent. Flowers with sepals homomorphic, ovate or elliptic; central-adaxial petal 3.2–3.6 × 2.4–2.6 cm, oblong-orbicular, two lateral-adaxial petals 3.2–3.6 × 2.3–2.5 cm, oblong-orbicular, two abaxial petals 3.2–3.8 × 2–2.7 cm, one obovate and the other cucullate; four median stamens with the filaments ca. 2–3 mm long and anthers 4–6 mm long, three abaxial stamens with filaments 6–10 mm long and anthers 8–10 mm long; ovary sericeous, style glabrescent, stigma 0.2–0.5 mm diam. Fruit with stipe 0.6–1 cm long, body 8–12 × 0.8–1 cm, cylindrical, valves smooth.

**Representative Specimens Examined.** **BRAZIL. Alagoas:** Satuba, 6 Aug 2004 (fr.), *E. Barbosa* 58 (MAC); Maceió, Parque Municipal de Maceió, 27 Jul 2009 (fr.), *E. Chagas-Mota & E. Gonçalves* 4418 (MAC); Maceió, APA de Catolé e Fernão Velho, 15 Apr 2009 (fl.), *M. N. Rodrigues & M. V. Caju* 2503 (MAC); Murici, Poço D'Anta, ca. 16–19 km NW of Murici by road, Mata de Murici, 14 May 2001 (fl.), *W. W. Thomas* et al. 12,424 (RB). **Bahia:** Maraú, 6 May 1966 (fl.), *R. P. Belém & R. S. Pinheiro* 2091 (NY); Entre Rios, Fazenda Rio do Negro. Residual stands of the Atlantic Forest of the Rio do Negro valley, 27 May 2008 (fl.), *A. V. Popovkin* 281 (HUEFS); 21 Apr 2009 (fl.), *A. V. Popovkin* 563 (HUEFS); 27 Apr 2011 (fl.), *A. V. Popovkin & Mendes* 862 (HUEFS); Itacaré, Ubaitaba, capoeira, 14 Apr 1970 (fl.), *T. S. Santos* 687 (CEPEC, NY). **Paraíba:** Conde, área de preservação permanente da Tambaba, mata da chica, 28 May 2010 (fl.), *A. A. M. Araújo* et al. 272 (JPB, RB); João Pessoa, campus UFPB, 27 Mar 1979 (fl., fr.), *M. F. Agra s.n.* (EAC); Mataraca, Millennium Inorganic Chemicals Mineração Ltda: substrato areno-argiloso, mata de restinga, 20 Oct 2011 (fl.), *P. C. Gadelha-Neto* et al. 3092 (JPB, NY, RB); Rio Tinto, fragmento PB 114, 29 Mar 2012 (fl.), *P. C. Gadelha-Neto* 3250 (HUEFS, JPB, NY, RB). **Pernambuco:** Maraiá, Serra do Urubu, 19 Apr 1994 (fl.), *A. M. Miranda & L. P. Félix* 1511 (ALCB, RB); Igarassu, borda da mata, 3 May 2002 (fl.), *A. Oliveira & A. G. Silva* 8 (NY); Gravatá, engenho jussara, mata benedito, 7 Jul 2010 (fl.), *L. R. Silva* 288 (RB). **Rio de Janeiro:** Rio de Janeiro, restinga da Tijuca, 23 Apr 1944 (fl.), *O. Machado s.n.* (RB). **Sergipe:** Areia Branca, borda da trilha para os riachos que cortam a entrada, PARNA Serra da Itabaiana, 20 Apr 2008 (fl.), *A. Alves-Araújo* et al. 943 (ASE); Santa Luzia do Itanhê, Entrada 2 km à esquerda na estrada Sta.Luzia/Crasto, 14 Jun 1994 (fr.), *J. G. Jomar* et al. 471 (CEPEC, NY); Pirambu, 3 Apr 1984 (fl.), *G. Viana* 924 (ASE, CEN).

**Distribution & Habitat.** *Senna pinheiroi* is restricted to northeastern (Alagoas, Bahia, Paraíba, Pernambuco and





**Fig. 2** A, B. *Senna rugosa*: habit and inflorescence (A); flowers (B). C–F. *Senna pinheiroi*: fruit (C); habit and inflorescence (D); flowers (E); leaf with two extra-floral nectaries positioned between each pair of leaflets (F). [Credits: Dalva Queiroz (A), Alexandre Gibau de Lima (B, C), Alex Popovkin (D–F).]

Sergipe) and southeastern (Rio de Janeiro) Brazil, in the Atlantic Forest and Caatinga domains. The locality data of *Machado s.n.* (RB)—which refers to restinga vegetation of Tijuca in the municipality of Rio de Janeiro—is doubtful since no other individuals were found in Rio de Janeiro state nor in the neighboring Espírito Santo state during our field expeditions and herbarium studies. This species occurs in disturbed areas, at the edge of ombrophilous forests, in seasonal forests, restingas, brejos de altitude, and in rocky outcrops, mostly below 700 m a.s.l.

**Phenology.** Flowering from February to August and fruiting from June to March.

**Notes.** *Senna pinheiroi* is a shrub characterized by the leaf rachis with two extra-floral nectaries, the leaflets glossy on the adaxial surface, the leaflet venation reticulate, the sepals homomorphic, the corolla large and asymmetric, the petals 3–3.8 cm long, and the abaxial stamens approximately twice the length of the median stamens. Morphological distinctions between *S. pinheiroi* and *S. rugosa* are addressed above.

**3. *Senna latifolia*** (G. Mey.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 143 (1982). *Cassia latifolia* G. Mey., Prim. Fl. Esseq. 166 (1818). Fig. 6.

**Description.** Scandent shrub or vine 1–6 (–8) m tall; young branches slightly fractiflex, angulate, puberulent or glabrous. Stipules oblanceolate, obovate or suborbicular. Leaves with petiole 3.5–8 cm long; rachis 2–5.5 cm long; extra-floral nectaries 1 or sometimes 2, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina asymmetric or symmetric, elliptic or ovate, adaxial surface glabrous, abaxial surface sparsely puberulent or glabrous, chartaceous, leaflets of the proximal pair 6–11 × 4–7 cm, leaflets of the distal pair 8–15 × 5–9 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves shorter than the racemes; bracts 2–4 × 1–2 mm, ovate, usually caducous. Flowers with sepals heteromorphic, cymbiform, obovate or suborbicular; central-adaxial petal 2.8–3.2 × 2–2.3 cm, obovate-orbicular, two lateral-adaxial petals 2.6–3 × 2–2.2 cm, obovate-orbicular, two abaxial petals 2.6–3.2 × 2–2.2 cm, obovate; four median stamens with the filaments ca. 1–2.5 mm long and anthers 6–9 mm long, three abaxial stamens with filaments 2–5 mm long and anthers 5–7 mm long; ovary glabrous or sparsely sericeous, style glabrescent, stigma 1–2 mm diam. Fruit with stipe 0.5–1 cm long, body 8–32 × 1–1.3 cm, cylindrical, valves venulose.

**Representative Specimens Examined.** **BRAZIL.** Acre: Rio Branco, Parque Zoobotânico, 24 Apr 1992 (fl.), G. Claros 58 (INPA); Mâncio Lima, Parque Nacional da Serra do Divisor, Serra do Moa, eastern piedmont, 6 May 1996 (fl.), D. C. Daly et al. s.n. (NY); Sena Madureira, rio Macauã, colônia Bom Futuro, 30 Mar 1994 (fl.), L. A. Lima et al. 537 (NY). Amapá: Mazagão, rio Jarí, margem esquerda, morro do Felipe V, 21 Feb 1986 (fl.), M. J. P. Pires et al. 791 (INPA, NY); Macapá, estrada

da fazendinha, ramal do gruta, 15 Feb 1984 (fl.), B. V. Rabelo 2524 (NY); Rio Matapi, entre a estrada do Matapi e do rio, 4 Mar 1983 (fl.), B. V. Rabelo 1847 (NY). Amazonas: Manaus-Porto Velho highway km 124, open roadside, 21 Mar 1974 (fl.), D. G. Campbell et al. s.n. (NY); Careiro da Várzea, BR- 319, sentido Porto Velho, a ca. 30 km entra a esquerda antes de um posto de gasolina e segue até ca. 9 km sentido lago Santa Maria de Purupuru, 25 Apr 2010 (fl.), D. Cardoso et al. 2878 (HUEFS); Esperança, 27 Jan 1942 (fl.), A. Ducke 891 (NY); Presidente Figueiredo, vila de Balbina, 4 Jan 2006 (fr.), J. A. C. Silva 1199 (INPA). Maranhão: São Benedito do Rio Preto, 2 Jun 1979 (fl., fr.), A. J. Castro & E. Nunes s.n. (EAC); Imperatriz, campestre, 28 Mar 1976 (fl.), G. Hatschbach et al. 38,467 (MBM); Grajaú, rodovia a 6 km da cidade de Grajaú, 21 Apr 1983 (fl.), M. F. F. Silva et al. 1150 (NY). Mato Grosso: Santa Cruz do Xingu, Parque Estadual do Xingu, limite norte do parque, 3 Mar 2011 (fl., fr.), C. R. A. Soares et al. 3149 (RB, HUEFS); São Félix do Araguaia, beira do rio, localmente chamado de “riozinho” (paralelo ao rio das Mortes), 17 Mar 1997 (fl.), V. C. Souza et al. 14,355 (ESA, UEC, UFG, UB, SPI). Pará: Parque Indígena do Tumucumaque, rio Parú d’ Oeste, missão Teriyó, 20 Feb 1970 (fl.), P. B. Cavalcante 2455 (NY); Serra dos Carajás, “azul”, near camp at serra norte, 8 Dec 1981 (fl.), D. C. Daly et al. 1799 (NY); Vigia, along highway PA- 140, 29 Mar 1980 (fl.), G. Davidse 17,535 (NY); Itaituba, Parque Nacional da Amazônia, beira da BR- 230, 17 May 2011 (fr.), R. B. Pinto & V. F. Mansano 219 (IAN, NY, MG, RB); Belém, IPEAN, 30 Mar 1967 (fl., fr.), J. M. Pires & N. T. Silva 10,509 (NY); Conceição do Araguaia, ca. 20 km W of redenção, near correio São João and troncamento Santa Teresa, 12 Feb 1980 (fl., fr.), T. C. Plowman et al. 8735 (NY, US); Porto Trombetas, mineração rio do Norte, 1990 (fl.), E. Soares 769 (INPA); Belém, 8 Feb 1964 (fl.), N. T. Silva s.n. (NY). Rondônia: Porto Velho, ramal acesso garimpo, 8 May 2013 (fl.), N. C. Bigio et al. 884 (CEN, NY, RB, RON). Roraima: Pacaraima, BR- 174, sentido Boa Vista- Pacaraima, Serra de Pacaraima, 18 Apr 2010 (fl., fr.), D. Cardoso & T. M. Moura 2850 (HUEFS); Mucajaí, along Mucajaí – Caracá road (BR- 174), 8 Nov 1977 (fl.), L. Coradin 1022 (CEN, NY). Tocantins: Pindorama do Tocantins, bacia do Tocantins, sub-bacia rio Balsas, estrada de terra para Natividade, 16 Oct 2008 (fr.), L. L. Guimarães et al. s.n. (EAC); Araguaína, ca. 2 km N of Araguaína, 13 Mar 1968 (fl.), H. S. Irwin et al. 21,141 (NY); Ananas, acampamento de ENGEVIX, próximo ao aeroporto, 15 Apr 2004 (fl.), G. Pereira-Silva et al. 8612 (CEN).

**Distribution & Habitat.** *Senna latifolia* is widespread in South America, occurring in Amazonian and Andean forests in Bolivia, Brazil, Colombia, French Guiana, Guyana, Peru, Suriname, and Venezuela (Irwin & Barneby, 1982). In Brazil, it has been collected in the central-western (Mato Grosso), northeastern (Maranhão), and northern (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima, and Tocantins) regions, in the Amazonian and Cerrado domains. It grows on clay, sandy, and rocky soils at the edge of ombrophilous forests, in riparian forests, terra firme forests, igapó forests, Amazonian savannas, and disturbed areas, mostly below 600 m a.s.l.

**Phenology.** Flowering from October to July and fruiting from February to August.

**Notes** *Senna latifolia* is readily recognized by its broadly suborbicular, obovate or oblanceolate stipules (these sometimes falcate), coriaceous leaflets, rigid and yellowish sepals, cymbiform outermost sepal, three abaxial stamens up to a third longer than the median ones, and dilated stigma 1–1.5 mm in diameter. It can be distinguished from *S. quinquangulata* by the ovate extra-floral nectary on the leaf rachis (vs. fusiform in *S. quinquangulata*), cymbiform and rigid outermost sepal (vs. ovate and membranaceous), and 2–2.3 cm wide petals (vs. 0.6–1.2 cm wide).



4. *Senna quinquangulata* (Rich.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 153 (1982). *Cassia quinquangulata* Rich., Actes Soc. Hist. Nat. Paris 108 (1792). Fig. 3.

**Description.** Scandent shrub or vine 1–10 m tall; young branches slightly fractiflex or curved, angulate, puberulent or glabrescent. Stipules oblanceolate or linear. Leaves with petiole 2.5–5 cm long; rachis 1.5–6 cm long; extra-floral nectaries 2, stipitate, straight lanceolate and sometimes incurved; leaf rachis appendage setaceous; leaflet lamina elliptic or ovate, lamina asymmetric, adaxial surface glabrous or sparsely puberulent, abaxial surface glabrous or puberulent, chartaceous, leaflets of the proximal pair 6.5 × 4 cm, leaflets of the distal pair 8–15 × 3–8 cm. Inflorescences terminal panicle composed of laxly arranged racemes, the subtending leaves shorter than the racemes and usually reduced to a petiole and leaf rachis; bracts 2–6 × 1–2 mm, lanceolate or oblanceolate, caducous or persistent during anthesis. Flowers with sepals homomorphic, ovate or oblong; central-adaxial petal 1–1.6 × 0.8–1.2 cm, obovate, two lateral-adaxial petals 1–1.6 × 0.8–1.2 cm, obovate, two abaxial petals 1.2–1.8 × 0.8–1.2 cm, obovate; four median stamens with the filaments ca. 1.2–2 mm long and anthers 5–9 mm long, three abaxial stamens with filaments 2–3 mm long and anthers 3–5 mm long; ovary sericeous, style glabrescent, stigma 1.2–2 mm diam. Fruit with stipe ca. 3–5 mm long, body 13–28 × 1–1.5 cm, cylindrical, valves venulose.

**Representative Specimens Examined.** **BRAZIL.** **Acre:** Rio Branco, área do Parque Zoológico da UFAC, trilhas próximo ao Herbário, 19 May 1991 (fl.), C. A. *Cid* et al. 10,109 (NY); Reserva extrativista do Alto Juruá, in the vicinity of Igarapé Caipora, 19 Jul 1992 (fr.), L. C. *Ming* 321 (NY). **Alagoas:** Pilar, mata do Lamarão, 18 Jul 2006 (fl., fr.), C. *Amaral* & E. *Santos* 75 (ASE); Murici, serra do ouro, caminho para a estação da embaúta, 15 Mar 2002 (fl.), R. P. *Lemos* et al. 6295 (ALCB, MAC, NY); São Luis do Quitunde, local de coleta castanha grande, 10 Apr 1980 (fl.), R. P. *Lyra* 240 (MAC, RB). **Amapá:** Oiapoque, river banks between Oiapoque and Santo Antonio, 26 Jul 1980 (fl.), H. S. *Irwin* et al. 47,157 (IAN, NY); Rio Oiapoque, about 0.5 km W of Cachoeira Utussansain, 8 Sep 1960 (fl.), H. S. *Irwin* et al. 48,092 (IAN, NY); Mazagão, médio do rio Maracá, 16 May 1983 (fr.), B. V. *Rabelo* et al. 2245 (NY). **Amazonas:** Careiro Castanho, propriedade Bom Futuro, lote 159, vicinal 2 da BR 319, Aug 2004 (fl., fr.), C. G. *Bacelar-Lima* et al. 30 (INPA); Parana do Autaz-Mirim, lago do Caió, 26 Aug 1973 (fl., fr.), C. C. *Berg* et al. 19,770 (INPA, NY); São Gabriel da Cachoeira, estrada BR- 307, 19 Jul 1979 (fl.), L. A. *Maia* et al. 757 (INPA); Manaus, Reserva Florestal Adolpho Ducke, 15 May 1997 (fl.), L. H. P. *Martins* et al. 3 (INPA, RB); Manaus, Ponta Negra, cachoeira alta, 11 Jan 1961 (fl.), W. *Rodrigues* & J. *Chagas* 2078 (INPA); Manaus, estrada do Aleixo km 3, sede do INPA, 4 Nov 1975 (fl.), M. F. *Silva* 1830 (INPA). **Bahia:** Una, Reserva Biológica do Mico-Leão (IBAMA), entrada no km 46 da BA- 001 Ilhéus/Una, 9 May 1998 (fl., fr.), A. M. *Amorim* et al. 2410 (CEPEC, NY); Valença, estrada para Orobó, 10 Jan 1982 (fl.), G. P. *Lewis* & A. M. *Carvalho* 1071 (MBM, NY); Rio Real, litoral Norte, vale do rio Itapicuru, Aug 1950 (fl.), G. C. P. *Pinto* s.n. (ALCB); Salvador, ilha dos Frades, ponta de Nossa Senhora, 16 Jul 2012 (fl.), E. P. *Queiroz* et al. 5374 (ALCB). **Ceará:** Aratuba, sítio Pau Cardoso, 14 May 1980 (fl.), E. *Nunes* & P. *Martins* s.n. (EAC); Maranguape, topo da serra, 28 Jun 1981 (fl., fr.), E. *Nunes* & P. *Martins* s.n. (EAC); Guaramiranga, Pacoti, 27 Jul 1991 (fl., fr.), E. *Nunes* et al. s.n. (EAC). **Maranhão:** Turiaçu, km 6 da BR- 106, fazenda Maracaçumê Agro Industrial, 1 Dec 1978 (fr.), N.

A. *Rosa* & H. *Vilar* 2820 (NY). **Mato Grosso:** Itaúba, resgate de Flora da UHE Colíder, lote D de supressão, 05 May 2015 (fl.), R. C. *Santos* et al. 217 (RB); Matupá, localidade BR- 080, agropecuária Cachimbo, fazenda São José, 25 Apr 1997 (fl.), V. C. *Souza* et al. 15,681 (ESA, UEC). **Pará:** Marabá, Serra dos Carajás, 30 Mar 1977 (fl., fr.), M. G. *Bahia* et al. 2948 (NY); Santarém-Cuiabá highway, km 812 along BR- 163, 21 Feb 1977 (fl.), J. H. *Kirkbride* & E. *Llera* 2959 (NY); Porto Trombetas, aeroporto, 5 Oct 1987 (fl.), O. H. *Knowles* s.n. (INPA); Acará, Thomé Assú, água branca, 21 Jul 1931 (fl.), Y. *Mexia* 5950 (NY, US); Itaituba, estrada Santarém-Cuiabá, BR- 163, km 1007 a 1012, 15 May 1983 (fl.), M. N. F. *Silva* 350 (NY). **Paraíba:** João Pessoa, jardim botânico Benjamim Maranhão, 11 Aug 2008 (fl.), F. L. R. *Filardi* et al. 894 (JPB, RB); Rio Tinto, fragmento Pb 114, 29 Mar 2012 (fl., fr.), P. C. *Gadelha-Neto* 3249 (JPB, RB); Areia, Escola de Agronomia do Nordeste, 10 May 1953 (fl.), J. C. *Moraes* 883 (NY). **Pernambuco:** Jaqueira, usina Frei Caneca, Mata do Monteiro, 1 Jun 2011 (fl., fr.), D. S. *Correia* et al. 131 (NY); Recife, mata de Dois Irmãos, 20 Feb 1990 (fl.), M. L. *Guedes* et al. 2316 (ALCB); Caruaru, distrito de Murici, brejo dos cavalos, 28 Feb 1996 (fl.), D. S. *Pimentel* & M. B. *Amaral* 25 (NY). **Rondônia:** Jaciparaná, island in rio Madeira at mouth of rio Jaciparaná, 29 Jun 1968 (fl.), G. T. *Prance* et al. 5346 (NY). **Roraima:** Serra dos Surucucus, NE of Mission station, 17 Feb 1969 (fl.), G. T. *Prance* et al. 10,005 (INPA, NY); Mucajá, rio Mucajá, Mar 1971 (fl.), G. T. *Prance* et al. 11,185 (INPA, NY). **Sergipe:** Capela, próximo à nascente do rio Siriri, 24 Mar 1995 (fl., fr.), M. *Landim* 255 (HUEFS).

**Distribution & Habitat.** *Senna quinquangulata* is widespread from Mexico to Brazil (Irwin & Barneby, 1982). In Brazil, it occurs in the central-western (Mato Grosso), northern (Acre, Amapá, Amazonas, Pará, Rondônia, and Roraima) and northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco and Sergipe) regions, in the Amazonian, Caatinga, Cerrado, and Atlantic Forest domains. It occurs at the edge of ombrophilous forests, in seasonal forests, Amazonian savannas, igapó forest, cangas, brejos de altitude, coastal forests, riparian forests and disturbed areas, from sea level up to 1200 m a.s.l.

**Phenology.** Flowering and fruiting throughout the year.

**Notes.** Irwin and Barneby (1982) recognized two varieties of *Senna quinquangulata*. Only *S. quinquangulata* var. *quinquangulata* is found in Brazil. It can be morphologically recognized by its leaf rachis with two extra-floral nectaries, asymmetric leaflet base, terminal panicle composed of laxly arranged racemes, three abaxial stamens of equal length or a little shorter than the median ones, and its stigma 1.2–2 mm in diameter. It can be distinguished from *S. undulata* by the bracts 2–6 × 1–2 mm and caducous or persistent during anthesis (vs. 8–15 × 3–7 mm and persistent during and after anthesis in *S. undulata*), the stigma 1.2–2 mm in diameter (vs. 0.4–0.8 mm). The morphological distinctiveness between *S. quinquangulata* and *S. latifolia* is addressed above.

5. *Senna dryadica* A. Lima & V.F. Mansano, Nord. J. Bot. 9 (2023): article e03947.

**Description.** Scandent shrub 1.5 m tall; young branches straight or slightly curved, angulate, glabrous. Stipules narrowly lanceolate to filiform. Leaves with petiole 5–7.5 cm long; rachis 2–3 cm long; extra-floral nectary 1, stipitate, fusi-form or capitate; leaf rachis appendage filiform; leaflet lamina

elliptic, lamina asymmetric, adaxial surface glabrous, abaxial surface glabrous or sparsely pubescent, chartaceous, leaflets of the proximal pair 7–8 × 3.3–4.5 cm, leaflets of the distal pair 9.5–12 × 4–5.5 cm. Inflorescences axillary racemes, the subtending leaves shorter than the racemes; bracts 5–6 × 2 mm, ovate or elliptic, caducous during anthesis. Flowers with sepals homomorphic, ovate or oblong; central-adaxial petal 1.6 × 1–1.2 cm, obovate, two lateral-adaxial petals 1.2–1.5 × 0.7–1 cm, obovate, two abaxial petals 1.3–1.5 × 0.7–1 cm, obovate; four median stamens with the filaments ca. 2.5 mm long and anthers 6–8 mm long, three abaxial stamens with filaments 3 mm long and anthers 6–8 mm long; ovary sericeous, style glabrescent, stigma 0.2–0.4 mm diam. Fruit unknown.

**Representative Specimens Examined.** **BRAZIL.** **Rio de Janeiro:** Santa Maria Madalena, Parque Estadual do Desengano, caminho do ribeirão vermelho, mata secundária, 800–900 m a.s.l., 28 April 1995, (fl.), L. C. Giordano et al. 1945 (holotype: RB); Santa Maria Madalena: borda de floresta, na base da Pedra Dubois, 08 Nov 2021, (st.), A. Lima et al. 542 (RB); Santa Maria Madalena: 16 Mar 1995, (fl.), E. Pereira 1249 (RB).

**Distribution & Habitat.** *Senna dryadica* is endemic to the Brazilian Atlantic Forest of Rio de Janeiro (Lima et al., 2023). It occurs on the edge of the ombrophilous montane forests, mostly close to creeks and wet environments, from 800 to 900 m a.s.l. *Senna dryadica* apparently does not occur sympatrically with the morphologically similar species *S. quinquangulata*, which has its southern distributional limit in the Atlantic Forest of Bahia.

**Phenology.** Flowering from March to April..

**Notes.** *Senna dryadica* is a rare and recently described species characterized by its quadrangular branches, petiole at least twice longer than the leaf rachis, a single extrafloral nectary inserted on the leaf rachis, asymmetric leaflets, petals 1.2–1.6 × 0.7–1.2 cm, abaxial stamens shorter than the median ones, and stigma 0.2–0.4 mm in diameter.

*Senna dryadica* can be distinguished from *S. quinquangulata* var. *quinquangulata* by the petiole at least twice longer than the leaf rachis (versus mostly up to 1.5 longer in *S. quinquangulata* var. *quinquangulata*), a single extrafloral nectary on the leaf rachis (versus two), the stigma not dilated, and 0.2–0.4 mm diam. (versus dilated, and 1.2–2 mm in diameter). *Senna dryadica* can be distinguished from *S. affinis* by the branches straight or slightly curved (versus zig-zagged), the extrafloral nectary on the leaf rachis fusiform (versus ovate), and the abaxial stamens shorter than the median ones (versus longer).

**6. *Senna undulata*** (Benth.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 157 (1982). *Cassia undulata* Benth., J. Bot. (Hooker). 2: 76 (1840). Fig. 3.

**Description.** Scandent shrub or vine 1–6 m tall; young branches slightly fractiflex or straight, angulate,

puberulent or glabrescent. Stipules oblanceolate or linear. Leaves with petiole 2–4.5 cm long; rachis 1.5–3 cm long; extra-floral nectaries 2, stipitate, fusiform; leaf rachis appendage setaceous; leaflet lamina elliptic or ovate, lamina asymmetric, adaxial surface glabrous, abaxial surface puberulent or glabrescent, chartaceous, leaflets of the proximal pair 3–6.5 × 2.5–3.5 cm, leaflets of the distal pair 6–12 × 2.5–5 cm. Inflorescences axillary racemes, the subtending leaves shorter than the racemes; bracts 8–15 × 3–7 mm, lanceolate or oblanceolate, persistent during and after anthesis. Flowers with sepals homomorphic, ovate, oblong or suborbicular; central-adaxial petal 1.4–1.8 × 1–1.4 cm, obovate, two lateral-adaxial petals 1.4–1.8 × 0.8–1 cm, obovate, two abaxial petals 1.4–2 × 0.8–1.2 cm, obovate; four median stamens with the filaments ca. 1.2–2 mm long and anthers 5.5–8.5 mm long, three abaxial stamens with filaments 2–3.5 mm long and anthers 3.5–5 mm long; ovary sericeous, style glabrescent, stigma 0.4–0.8 mm diam. Fruit with stipe ca. 2–4 mm long, body 10–24 × 0.8–1.2 cm, cylindrical, valves slightly venulose.

**Representative Specimens Examined.** **BRAZIL.** **Amapá:** Road to Amapá, km 48, Macapá, 7 Jul 1962 (fl.), J. M. Pires & P. B. Cavalcante 51,981 (NY, SP, US); coastal region, road to Amapá, km 110, 20 Jul 1962 (fl.), J. M. Pires & P. B. Cavalcante 52,227 (NY). **Amazonas:** 28 Dec 1975 (fl.), M. L. Porto 1978 (ICN). **Pará:** Ilha do Mosquito, 3 Nov 1929 (fl.), E. P. Killip & A. C. Smith 30,493 (NY); Região do Rio Jarí, serrinha entre M. Dourado e Planalto A, 12 Sep 1968 (fl.), N. T. Silva 963 (NY). **Roraima:** Caracará, estrada Manaus–Caracará (BR- 174/210) entre km 530 e 540, 27 Aug 1987 (fl.), C. A. C. Ferreira et al. 9258 (NY); Boca da Mata, base of Serra Tepequem, 11 Feb 1967 (fl.), G. T. Prance et al. 4330 (INPA, NY); Estrada Boa Vista–Caracará, margem da estrada, 15 Feb 1977 (fr.), N. A. Rosa & M. R. Cordeiro 1508 (INPA, NY); Caracará, BR- 174, Manaus–Venezuela Highway, estrada Manaus–Boa Vista, 52 km N of Caracará, 4 Dec 1977 (fl.), W. C. Steward et al. 259 (INPA, NY). **Tocantins:** Itacaja, território indígena Krahô, aldeia Santa Cruz, pelo rio Manoel Alves, capoeira do Sr. Tavarinho, 13 Dec 2000 (fl., fr.), T. A. B. Dias 926 (CEN).

**Distribution & Habitat.** *Senna undulata* occurs from southern Mexico to northern Brazil (Irwin & Barneby, 1982). In Brazil, it has been recorded from the states of Amapá, Amazonas, Pará, Roraima and Tocantins, in the Amazonia domain. It can be found growing at the edge of terra firme forests, in igapó forests, coastal forests, Amazonian savannas and disturbed areas, mostly below 500 m a.s.l.

**Phenology.** Flowering throughout the year, collected in fruit in February.

**Notes.** *Senna undulata* is readily recognized by its oblanceolate and falcate stipules, leaf rachis with two extra-floral nectaries, acute to acuminate leaflet apex, persistent sepallid bracts, and the three abaxial stamens up to a third longer than the median ones. Morphological distinctions between *S. undulata* and *S. quinquangulata* are addressed above under the latter.



**Fig. 3** A–C. *Senna quinquangulata*: flowers with sets of stamens (A); flowers with dilated stigma (B); leaf with two extra-floral nectaries positioned between each pair of leaflets (C). D–F. *Senna undulata*: flowers with sets of stamens (D); bracts (E); flower (F). [Credits: Rubens Queiroz (A–C), W. John Hayden (D–F).]



7. *Senna rionegrensis* A. Lima & V.C. Souza, **sp. nov.**—  
Type: Brazil, Amazonas: Providencia, Rio Negro, 12  
Feb 1944 (fl.), *J. T. Baldwin 3268* (holotype: IAN herb.  
no. 31942 [!]; isotype: US herb. no. 1879223 [digital  
image!]). Fig. 4.

**Diagnosis.** *Senna rionegrensis* is morphologically similar to *S. wurdackii* H.S. Irwin & Barneby, but it can be distinguished by the leaf rachis with only one extra-floral nectary on the adaxial side (vs. two in *S. wurdackii*), the venation on the adaxial surface of leaflets prominent (vs. usually immersed), and the abaxial stamens in a set of three (vs. two). It also resembles *S. rupununiensis* H.S. Irwin & Barneby, but it differs by the leaf rachis with only one extra-floral nectary on the adaxial side (vs. two in *S. rupununiensis*), and the abaxial stamens shorter than the median ones (vs. of equal length or the abaxial stamens up to a third longer).

**Description.** Vine extending to ca. 5 m; young branches cylindrical, slightly fractiflex or straight, glabrous. Stipules 3–4 × 0.1–0.2 mm, falcate, narrowly lanceolate, glabrous. Leaves with petiole 3.2–3.6 cm long, sparsely pubescent; rachis 1.4–1.7 cm long, sulcate, sparsely pubescent; extra-floral nectary 1, positioned between the proximal pair of leaflets, 2–4 mm long, stipitate, fusiform; leaf rachis appendage positioned at the apex of rachis on the abaxial surface, ca. 1 mm long, filiform, persistent; leaflets of the proximal pair 4–5 × 2–2.2 cm, lamina asymmetric, ovate or elliptic, base rounded, apex obtuse and retuse, leaflets of the distal pair 6.5–7.5 × 2.5–3 cm, lamina asymmetric, elliptic to lanceolate, base obtuse, apex obtuse and slightly retuse, both pairs with margins revolute, adaxial and abaxial surfaces glabrous, lustrous on the adaxial surface, penninerved, veins prominent on the adaxial surface, secondary veins brochidodromous, tertiary venation reticulate. Inflorescences axillary racemes, the subtending leaves longer than the racemes or equally long; peduncle 1.5–2 cm long, pubescent; rachis 0.5–1 cm long, pubescent; bracts 2–4 × 1 mm, elliptic, cymbiform, glabrous, caducous. Flowers with pedicel 1.5–2 cm long, pubescent; sepals 0.7–0.9 × 0.3–0.6 cm, subequal, obovate, the outermost cucullate, base truncate, apex rounded or obtuse, pubescent or glabrescent on the abaxial surface, glabrous on the adaxial surface; corolla slightly asymmetric, central-adaxial petal 1.6–1.8 × 1–1.2 cm, obovate, base unguiculate, apex retuse, two lateral-adaxial petals 1.5–1.7 × 1 cm, obovate, base unguiculate, apex rounded, two abaxial petals 1.8–2 × 1–1.2 cm, one obovate and the other slightly incurved and cucullate, base unguiculate, apex rounded, puberulent or glabrescent on the abaxial surface, glabrous on the adaxial surface; three adaxial staminodes 1.5–2 mm long, four median stamens with the filaments 3 mm long and anthers 6 mm long, oblong, apex geniculate, three abaxial stamens with filaments 2 mm

long and anthers 3 mm long, oblong, apex geniculate; ovary 13–16 mm long, glabrescent, stipe 2 mm long, glabrous, style 3–6 mm long, glabrous. Fruit stipe 0.7–1 cm long, fruit body 12–21 × 1.5–1.8 cm, cylindrical, valves venulose, dark brown, margin thickened.

**Additional Specimens Examined.** BRAZIL: Amazonas: Igapó, between Rio Ararirá and Rio Preto, 0°15′–30′S/63°35′ to 64°5′W, 8 Oct 1987 (fr.), P. J. M. Maas, M. G. M. Roosmalen, B. & R. P. Lima 6646 (INPA, NY, RB).

**Etymology.** The specific epithet of the new species refers to its habitat and also honors the Negro River for its economic, ecological, social, and cultural importance.

**Distribution & Habitat.** *Senna rionegrensis* is known from the basin of the Negro River in the state of Amazonas (Fig. 5). The label of the specimen *Baldwin 3268* indicates the collection locality as “Providencia, river Negro”, and that of *Maas et al. 6646* refers to the “river ararirá” which is situated in the basin of the Negro River, near the city of Barcelos.

**Phenology.** Collected in flower in February and with mature fruits in October.

**Preliminary Conservation Status.** Data Deficient (DD). The geographic uncertainty in the preliminary conservation status arises from the absence of recent collections and the lack of precise locality data. Fieldwork is needed to better understand the distribution of *Senna rionegrensis*, assess subpopulation numbers, and support more robust conservation assessment.

**Notes.** *Senna rionegrensis* is characterized by asymmetric leaflets, prominent venation on the adaxial surface of the leaflets, having a single fusiform extra-floral nectary inserted between the proximal pair of leaflets, the set of abaxial stamens shorter than the median ones, and the fruits cylindrical with venulose valves. The flowering specimen *Baldwin 3268* was first cited by Irwin & Barneby (1982) as a poorly understood plant of *Senna* ser. *Bacillares* that required new collections (especially with fruits) to better clarify its taxonomic relationships. The collection *Maas et al. 6646*, in fruit, matches the *Baldwin* collection, allowing us to confirm the taxon as a new species, and to provide a full morphological description.

8. *Senna rupununiensis* H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 166–167 (1982).

**Description.** Scandent shrub or vine; young branches slightly fractiflex, cylindrical, puberulent or glabrescent. Stipules narrowly lanceolate or linear. Leaves with petiole 1.5–4 cm long; rachis 1.5–3 cm long; extra-floral nectaries 2, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina elliptic or oblanceolate, lamina asymmetric, adaxial surface glabrous, abaxial surface pubescent, chartaceous,

leaflets of the proximal pair  $2.5\text{--}6.5 \times 1.5\text{--}2.5$  cm, leaflets of the distal pair  $6\text{--}9.5 \times 1.5\text{--}3$  cm. Inflorescences axillary or terminal racemes, the subtending leaves shorter than the racemes; bracts  $3\text{--}5 \times 1\text{--}1.8$  mm, lanceolate, caducous or sometimes persistent during anthesis. Flowers with sepals heteromorphic, ovate or suborbicular; central-axial petal  $1.5\text{--}2 \times 1\text{--}1.2$  cm, obovate or suborbicular, two lateral-axial petals  $1.3\text{--}1.8 \times 0.9\text{--}1$  cm, obovate, two abaxial petals  $1.3\text{--}1.8 \times 0.9\text{--}1$  cm, obovate; four median stamens with the filaments ca.  $1.4\text{--}1.5$  mm long and anthers  $6\text{--}7.5$  mm long, three abaxial stamens with filaments  $3\text{--}4$  mm long and anthers  $6\text{--}7$  mm long; ovary sericeous, style glabrescent, stigma  $0.6\text{--}0.8$  mm diam. Fruit with stipe  $2\text{--}4$  mm long, body  $6.5\text{--}12 \times 1\text{--}1.5$  cm, cylindrical, valves slightly venulose or smooth.

**Representative specimens examined.** BRAZIL. Roraima. Boa Vista, estrada para a Colônia do Apiauí, 7 Aug 1986 (fl.), J. A. Silva et al. 675 (INPA, NY); Boa Vista, Rio Branco, Jul 1913 (fl.) J. G. Kuhlmann 3232 (NY); Mucajaí, margem do rio Mucajaí, 6 Aug 1986 (fl.), E. L. S. Silva 749 (NY, US).

GUYANA. Basin of Rupununi River, near mouth of Charwair Creek, 1 Nov 1937 (fl., fr.), A. C. Smith 2358 (NY, US).

**Distribution & Habitat.** *Senna rupununiensis* occurs in Brazil and Guyana. In Brazil, the species is known from only a few collections from the state of Roraima in the Amazonian domain. It grows on sandy or clay soils at the edge of riparian forests and Amazonian savannas, mostly below 400 m a.s.l.

**Phenology.** In Brazil, the species has been collected in flower in July and August; specimens with fruits were collected in Guyana in November.

**Notes.** *Senna rupununiensis* can be recognized by its leaf rachis with two extra-floral nectaries, leaflets with reticulate veins prominent on the adaxial surface, and fruits with slightly venulose valves and a thickened margin. It can be distinguished from *S. undulata* by the bracts  $3\text{--}5 \times 1\text{--}1.8$  mm and caducous, or sometimes persistent only during anthesis (vs.  $8\text{--}15 \times 3\text{--}7$  mm and persistent during and after anthesis in *S. undulata*), and the sepals heteromorphic (vs. homomorphic).

**9. *Senna subtrijuga*** H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 141–143 (1982).

**Description.** Vine ca.  $10\text{--}15$  m tall; young branches slightly fractiflex or curved, angulate, puberulent or glabrescent. Stipules narrowly lanceolate or linear. Leaves with petiole  $2.5\text{--}4$  cm long; rachis  $1.5\text{--}2.7$  cm long; extra-floral nectaries 2, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina elliptic, oblanceolate or obovate, lamina symmetric, adaxial surface glabrous, abaxial surface pubescent, chartaceous, leaflets of the proximal pair  $3.5\text{--}4.5 \times 2.8\text{--}3.7$

cm, leaflets of the distal pair  $6\text{--}9 \times 3\text{--}4.5$  cm. Inflorescences axillary or terminal racemes, the subtending leaves and the racemes equally long; bracts  $3\text{--}5 \times 1\text{--}1.8$  mm, cymbiform, persistent during anthesis. Flowers with sepals homomorphic, ovate or oblong; central-axial petal  $2\text{--}2.3 \times 1.2\text{--}1.5$  cm, obovate or oblong, two lateral-axial petals  $1.9\text{--}2.2 \times 1\text{--}1.2$  cm, obovate, two abaxial petals  $1.9\text{--}2.2 \times 1\text{--}1.2$  cm, obovate; four median stamens with the filaments ca.  $1.5\text{--}2$  mm long and anthers  $6\text{--}8$  mm long, three abaxial stamens with filaments  $2.5\text{--}4.5$  mm long and anthers  $6\text{--}7.5$  mm long; ovary sericeous, style glabrescent, stigma  $0.6\text{--}0.8$  mm diam. Fruit unknown.

**Distribution & Habitat.** *Senna subtrijuga* is endemic to the Atlantic Forest of southern Bahia, and known only by two collections. This rare species is a vine occurring in ombrophilous forest and reaching the forest canopy, near 100 m a.s.l.

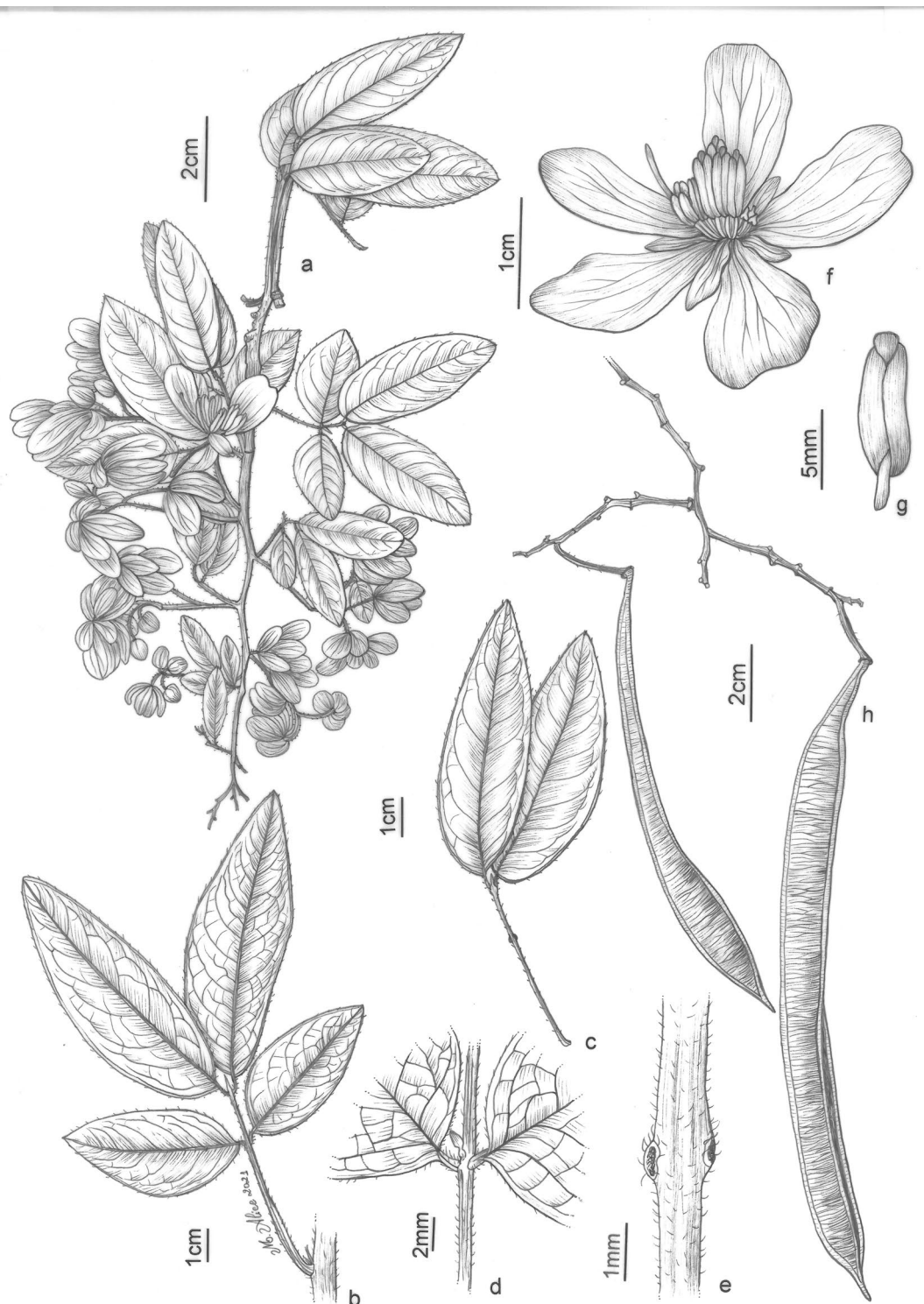
**Phenology.** Collected in flower in February and March.

**Representative Specimens Examined.** BRAZIL. Bahia: Santa Cruz Cabralia, mata costeira, 8 Mar 1967 (fl.), R. P. Belém & R. S. Pinheiro 3312 (holotype: CEPEC; isotype: IAN, GH, NY, RB); Porto Seguro, Estação Pau-Brasil, 14 Mar 2014 (fl.), D. M. Neves et al. 1751 (CEN, HUEFS, RB).

**Notes.** *Senna subtrijuga* can be recognized by its strongly sulcate leaf rachis, with two extra-floral nectaries, symmetric leaflet base, rigid outermost sepal, and the sets of stamens of equal length or with the abaxial ones just a little longer. Only two collections of this rare species are known, and more field collecting efforts are required.

**10. *Senna acutisepala*** (Benth.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 140 (1982). *Cassia acutisepala* Benth., Fl. Bras. 15(2): 97 (1870).

**Description.** Erect shrub or treelet  $2\text{--}5$  m tall; young branches slightly fractiflex or straight, cylindrical, sparsely puberulent or glabrous. Stipules setaceous. Leaves with petiole  $1.5\text{--}4.5$  (– $6.5$ ) cm long; rachis  $1.5\text{--}4.5$  cm long; extra-floral nectary 1, stipitate, fusiform or clavate; leaf rachis appendage unknown; leaflet lamina elliptic, lamina symmetric, adaxial surface glabrous, abaxial surface glabrous, chartaceous, leaflets of the proximal pair  $3\text{--}6 \times 2\text{--}4$  cm, leaflets of the distal pair  $5\text{--}10 \times 3\text{--}5.5$  cm. Inflorescences axillary racemes, the subtending leaves usually longer than the racemes; bracts  $3\text{--}6 \times 1\text{--}1.5$  mm, lanceolate, caducous. Flowers with sepals homomorphic, lanceolate; central-axial petal  $2.3\text{--}2.8 \times 1\text{--}1.2$  cm, oblong, two lateral-axial petals  $2\text{--}2.5 \times 0.9\text{--}1.2$  cm, oblong, two abaxial petals  $2.3\text{--}2.8 \times 1\text{--}1.3$  cm, one oblong and the other cucullate; four median stamens with the filaments ca.  $2\text{--}4$  mm long and anthers  $4.5\text{--}8$  mm long, three abaxial stamens with filaments  $2\text{--}5$  mm long and anthers  $6.5\text{--}8.6$  mm long; ovary sericeous,



**Fig. 4** *Senna rionegrensis*. **A.** Habit and flowering branch. **B.** Adaxial surface of leaf with details of leaflet venation. **C.** Abaxial surface of leaflets and rachis terminal appendage. **D.** Extra-floral nectary (adaxial surface). **E.** Indumentum of petiole and rachis (abaxial surface, leaflets removed). **F.** Flower in anthesis and androecium comprising three adaxial staminodes, four median stamens, and three abaxial stamens. **G.** Median stamen, anther with geniculate apex. **H.** Fruits. [A–F, based on Baldwin 3268; G, based on Maas et al. 6646; illustration by Maria Alice de Rezende.]



style glabrescent, stigma 0.5–0.7 mm diam. Fruit with stipe 2–5 mm long, body 8–14 × 1–1.2 cm, cylindrical, valves slightly venulose.

**Representative Specimens Examined.** **BRAZIL. Bahia:** Jacobina, 1850 (fl.), *Blanchet 3668* (MO, US); Mun. Itaberaba, Serra do Orobó, Fazenda Gameleira, 23 Apr 2006 (fr.), *D. Cardoso 1270* (HUEFS, NY); Mun. Bonito, Estrada para Bonito, Bonito, 6 Mar 1997 (fl.), *P. Gasson et al. 6098* (HUEFS, K); Saída de Santo Amaro ao entrocamento de Valença, Rod. BR 101, 7 May 1969 (fl.), *J. A. Jesus 345* (CEPEC, NY, RB); Estrada para Bonito, 32 km até entrada para Alto da MR, à esquerda mais 4 km., Morro do Chapéu, 18 Jun 2011 (fl.), *E. Melo 10,044* (HUEFS); Morro do Chapéu, Fazenda Guariba, Bacia do Salitre, cerrado, 12 Oct 2007 (fr.), *E. Melo & B. Marques-Silva 5195* (HUEFS); Mun. Maracás, Rod. BA 250, Faz. dos Pássaros a 24 km a E de Maracás, 4 May 1979 (fl.), *S. A. Mori & T. S. Santos 11,783* (CEPEC, K, NY, RB); Senhor do Bonfim, Serra de Sant'Ana, área de tensão ecológica, 27 Mar 2011 (fl.), *P. B. Schwartzburd 2425* (HUEFS). **Pernambuco:** Mun. Jataúba, Fazenda Balame, 26 Jul 1995 (fl.), *F. Moura 225* (EAC).

**Distribution & Habitat.** *Senna acutisepala* is restricted to Brazil, occurring in the states of Bahia and Pernambuco (and likely also in the states of Alagoas and Sergipe) in the Caatinga, Cerrado, and Atlantic Forest domains. In the protologue of *S. acutisepala*, Bentham (1870) mentioned the locality as “prov. Espírito Santo silvis”, but according to Irwin & Barneby (1982) the occurrence of this taxon in the forests of Espírito Santo state remains doubtful. In the present study, no collections of this species from Espírito Santo were found. *Senna acutisepala* occurs at the edges of the coastal ombrophilous forests, cipó forest, brejos de altitude, and disturbed areas, mostly from 100 to 1100 m a.s.l.

**Phenology.** Flowering from March to July and fruiting in April and October.

**Notes.** *Senna acutisepala* is a rare species, morphologically characterized by leaflets with a symmetric-cuneate base, a clavate or fusiform extra-floral nectary on the leaf rachis, lanceolate sepals with an acute apex, and fruits with slightly venulose valves. It can be distinguished from *S. affinis* by the symmetric-cuneate base of the leaflets (vs. asymmetric-oblique base in *S. affinis*) and homomorphic sepals with acute apex (vs. heteromorphic with obtuse or rounded apex). It also differs from *S. georgica* by the homomorphic sepals with an acute apex (vs. heteromorphic with obtuse or rounded apex in *S. georgica*) and cylindrical fruits (vs. laterally compressed).

**11. *Senna macrophylla* (Kunth) H.S. Irwin & Barneby,** Mem. New York Bot. Gard. 35: 137. (1982). *Cassia macrophylla* Kunth, Mimoses 126 (1823).

**Description.** Scandent shrub or treelet 1.5–5 m tall; young branches fractiflex, cylindrical or angulate, pubescent or sparsely pubescent. Stipules setaceous, oblanceolate or obovate. Leaves with petiole 8–25 cm long; rachis 4–12 cm long; extra-floral nectary 1, sessile, ovate or lanceolate; leaf rachis appendage setaceous; leaflet lamina elliptic, lamina subsymmetric, adaxial surface glabrous, abaxial surface tomentulose or sparsely pubescent, chartaceous, leaflets of the proximal pair 6–18 × 3–9 cm, leaflets of the distal pair (12–) 15–45 × 7–20 cm. Inflorescences axillary racemes, the subtending leaves longer than the racemes; bracts 3–6 × 1–1.5 mm, lanceolate or elliptic, caducous. Flowers with sepals subhomomorphic, ovate to



**Fig. 5** Distribution of *Senna rioneirensis* in the Negro River basin.

elliptic; central-axial petal  $2\text{--}2.8 \times 1\text{--}1.4$  cm, oblong, two lateral-axial petals  $2\text{--}2.6 \times 1\text{--}1.2$  cm, obovate or oblong, two abaxial petals  $2\text{--}2.6 \times 1\text{--}1.2$  cm, oblong; four median stamens with the filaments ca.  $2\text{--}3.5$  mm long and anthers  $5\text{--}8.3$  mm long, three abaxial stamens with filaments  $2\text{--}4$  mm long and anthers  $5.5\text{--}9$  mm long; ovary sericeous or glabrescent, style glabrescent, stigma  $0.5\text{--}0.7$  mm diam. Fruit with stipe  $5\text{--}10$  mm long, body  $13\text{--}30 \times 1$  cm, cylindrical, valves slightly corrugated.

**11a. *Senna macrophylla* var. *gigantifolia*** (Britton & Killip) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 139 (1982). *Chamaefistula gigantifolia* Britton & Killip, Ann. New York Acad. Sci. 35(3): 171–172 (1936).

**Representative Specimens Examined.** **BRAZIL.** **Acre:** Rio Branco, BR 364, km 30, 6 Oct 1980 (fl.), S. R. Lowrie et al. 423 (INPA, NY); Cruzeiro do Sul, ponto 2, SB 18, TB, 17 Feb 1976 (fl.), L. R. Marinho 213 (NY); Cruzeiro do Sul, Serra do Moa, vicinity of Serra do Moa, 22 Apr 1971 (fr.), G. T. Prance et al. 12,283 (INPA, NY). **Amazonas:** Esperança, (ad ostium fluminis Javary), ad ripas igarapé Santo Antonio, 17 Mar 1942 (fl.), A. Ducke 1502 (IAN, NY); behind Fonte Boa, rio Solimões Amazonas, 21 Aug 1973 (fl.), E. Lleras et al. 17,421 (INPA, NY); Estrada Manaus-Porto Velho, km 265, 17 Apr 1976 (fl.), O. P. Monteiro & J. Ramon 729 (INPA); Ilha Aramaçá, almost opposite Tabatinga, 24 Jul 1973 (fr.), G. T. Prance et al. 16,797 (INPA, NY). **Rondônia:** Machado River region, source of the Jaturaha River, Dec 1931 (fl.), B. A. Krukoff 1570 (MO, NY); Porto Velho, BR 29, 15 Jan 1963 (fl.), J. Oliveira s.n. (INPA, NY). **Roraima:** Alto Alegre, ilha de Maracá, SEMA Estação, Forest trails close to Estação, 9 Jun 1986 (fl.), M. J. G. Hopkins et al. 629 (INPA, NY); Ilha de Maracá, SEMA Ecological Reserve, 20 Apr 1987 (fl.), W. Milliken 75 (INPA, NY); Rio Uraricoeira, indian trail from Surucucu to Uaicá, 8 Mar 1971 (fl.), G. T. Prance et al. 10,905 (NY).

**Distribution & Habitat.** *Senna macrophylla* var. *gigantifolia* is widespread in Brazil, Ecuador, Colombia, Panama, Peru, and Venezuela (Irwin & Barneby, 1982). In Brazil, it occurs in the Amazonian domain, in the states of Acre, Amazonas, Rondônia, Roraima, and likely in Mato Grosso (on its border with Rondônia). It grows on clay and sandy soils, at the edge of terra firme forests, in riparian forests, and in disturbed areas, mostly below 200 m a.s.l.

**Phenology.** Flowering throughout the year and fruiting from April to August.

**Notes.** Two varieties were recognized by Irwin & Barneby (1982), but only *Senna macrophylla* var. *gigantifolia* (Britton & Killip) H.S. Irwin & Barneby occurs in Brazil. This taxon is characterized by its large distal leaflets ( $20\text{--}40 \times 7\text{--}20$  cm), densely flowered racemes shorter than the subtending leaf, prominent sepal veins, and fruits  $13\text{--}30$  cm long, constricted at the apex, and with slightly corrugated valves. It can be distinguished from *S. ruiziana* by the axillary inflorescence (vs. cauliflorous in *S. ruiziana*), the leaflet lamina symmetric or sometimes subsymmetric (vs. strongly asymmetric), the sepals with prominent veins (vs. not prominent), and the fruit straight

and  $13\text{--}30$  cm long (vs. falcate or cochleate and  $5\text{--}12$  cm long). It also differs from *S. herzogii* by the leaflet lamina symmetric or sometimes subsymmetric (vs. strongly asymmetric in *S. herzogii*), and the sepals with prominent veins (vs. immersed).

**12. *Senna ruiziana*** (G. Don) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 150 (1982). *Chamaefistula ruiziana* G. Don., Gen. Hist. Dichl. Pl. 2: 451 (1832).

**Description.** Scandent shrub or treelet  $1.5\text{--}10$  m tall; young branches slightly fractiflex, cylindrical, slightly pubescent or glabrous. Stipules oblanceolate or filiform. Leaves with petiole  $2.5\text{--}6.5$  cm long; rachis  $3\text{--}7$  cm long; extra-floral nectary 1, sessile, ovate; leaf rachis appendage glandular; leaflet lamina elliptic, obovate or ovate, lamina asymmetric, adaxial surface glabrous, abaxial surface sparsely pubescent or glabrescent, chartaceous, leaflets of the proximal pair  $8\text{--}18 \times 6\text{--}8$  cm, leaflets of the distal pair  $15\text{--}30 \times 7\text{--}12$  cm. Inflorescences cauliflorous racemes (on older parts of branches); bracts  $1.5\text{--}2 \times 1\text{--}1.5$  mm, lanceolate or ovate, caducous. Flowers with sepals heteromorphic, obovate-orbicular or oblong; central-axial petal  $1\text{--}1.5 \times 0.6\text{--}1$  cm, obovate-oblong, two lateral-axial petals  $1\text{--}1.4 \times 0.6\text{--}0.9$  cm, obovate, two abaxial petals  $1\text{--}1.5 \times 0.6\text{--}1$  cm, obovate; four median stamens with the filaments ca.  $1.5\text{--}3.5$  mm long and anthers  $3.2\text{--}6$  mm long, three abaxial stamens with filaments  $1.5\text{--}2.5$  mm long and anthers  $3\text{--}6$  mm long; ovary glabrescent, style glabrescent, stigma  $0.6\text{--}0.8$  mm diam. Fruit with stipe  $3\text{--}5$  mm long, body  $5\text{--}12 \times 1\text{--}1.2$  cm, cylindrical, valves slightly corrugated.

**Representative Specimens Examined.** **BRAZIL.** **Acre:** Cruzeiro do Sul, Reserva Extrativista do Alto Juruá, basin of Rio Juruá, Rio Bagé, near mouth of river, 11 Mar 1992 (fr.), D. C. Daly et al. 7361 (NY); Marechal Thaumaturgo, rio Juruá, reserva extrativista do Alto Juruá, N of São João do Breu, right bank, 2 Apr 1993 (fl., fr.), D. C. Daly et al. 7722 (INPA, NY); Manoel Urbano, Rio Purus, left bank, Colocação Nova Olinda, Sr. Raimundo Gomes ("Raimundo Cícero"), 25 Nov 1996 (fl.), D. C. Daly et al. 9159 (NY).

**Distribution & Habitat.** *Senna ruiziana* is restricted to western Amazonia and eastern Andean slopes in Brazil, Bolivia, Colombia, Ecuador and Peru (Irwin & Barneby, 1982; Bortoluzzi et al. 2020). In Brazil it is only known from a few collections from the state of Acre, where it occurs at the edge of riparian forests and in terra firme forests, mostly below 200 m a.s.l.

**Phenology.** Flowering in November, March and April, fruiting from March to April.

**Notes.** *Senna ruiziana* can be recognized by its asymmetric leaflets, remarkable cauliflorous inflorescence (positioned on the old part of branches), and falcate or cochleate fruits. Irwin and Barneby (1982) recognized two

varieties, but only *Senna ruiziana* var. *ruiziana* occurs in Brazil. It can be distinguished from *S. herzogii* by the oblanceolate or filiform stipules (vs. foliaceous in *S. herzogii*), cauliflorous inflorescence (vs. axillary), and falcate or cochleate fruit (vs. straight or only slightly curved).

- 13. *Senna herzogii*** (Harms) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 145 (1982). *Cassia herzogii* Harms, Meded. Rijks-Herb. 27: 37 (1915).

**Description.** Scandent shrub or treelet 1.5–6 m tall; young branches fractiflex, angulate, puberulent or glabrescent. Stipules foliaceous. Leaves with petiole 3–8 cm long; rachis 3–7 cm long; extra-floral nectary 1, sessile or stipitate, ovate or oblong; leaf rachis appendage glandular; leaflet lamina elliptic or elliptic-obovate, lamina asymmetric, adaxial surface glabrous, abaxial surface puberulent or glabrescent, chartaceous, leaflets of the proximal pair 10–18 × 5–10 cm, leaflets of the distal pair 16–22 × 5–10 cm. Inflorescences axillary racemes, the subtending leaves longer than the racemes; bracts 2–5 × 1–2 mm, elliptic or ovate, persistent during anthesis. Flowers with sepals homomorphic, obovate-orbicular; central-adaxial petal 1.5–2.1 × 1–1.4 cm, obovate-oblong, two lateral-adaxial petals 1.5–1.8 × 0.9–1.2 cm, obovate, two abaxial petals 1.5–1.8 × 0.9–1.2 cm, obovate; four median stamens with the filaments ca. 1.4–2.3 mm long and anthers 4–6.5 mm long, three abaxial stamens with filaments 2–2.8 mm long and anthers 3–5.5 mm long; ovary glabrescent, style sericeous, stigma 0.8–1 mm diam. Fruit with stipe 4–6 mm long, body 6–13 × 1 cm, subcylindrical, valves corrugated.

**Representative Specimens Examined.** BRAZIL. Acre: Manoel Urbano, rio Chandless (tributary of rio Purus), left bank, 18 Mar 2002 (fr.), D. C. Daly et al. 11,397 (NY).

PERU. Ucayali: Prov. Purús, camino a la quebrada de Esperancilla, 19 Mar 2002 (fl., fr.), J. Schunke-Vigo & J. G. Graham S15082 (NY).

**Distribution & Habitat.** *Senna herzogii* was previously only known from Andean and Amazonian moist forests in Bolivia and Peru (Irwin & Barneby, 1982). In Brazil it was collected for the first time in 2002 on seasonally flooded riverbanks of the Chandless River, in the state of Acre.

**Phenology.** Fruiting in March in Brazil.

**Notes.** This scandent shrub can be recognized by its large foliaceous stipules, glandular rachis appendage, asymmetric leaflet base, the median and abaxial stamens of equal length or sometimes the abaxial ones slightly longer, and subcylindrical fruits with corrugated valves. Morphological distinctions between *S. herzogii*, *S. ruiziana* and *S. macrophylla* are discussed under those two species.

- 14. *Senna bacillaris*** (L.f.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 111 (1982). *Cassia bacillaris* L.f., Suppl. Pl. 231 (1781).

**Description.** Scandent shrub or treelet 2–8 m tall; young branches fractiflex, cylindrical, tomentulose, puberulent or glabrescent. Stipules filiform. Leaves with petiole 3–6 cm long; rachis 1.5–5 cm long; extra-floral nectary 1, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina elliptic or ovate, lamina asymmetric, adaxial surface tomentulose, or sparsely pubescent, abaxial surface tomentulose or tomentulose, chartaceous, leaflets of the proximal pair 5–10 × 3–6 cm, leaflets of the distal pair 8–16 × 4–10 cm. Inflorescences axillary racemes or terminal panicles, with the subtending leaves longer than the racemes; bracts 1–3 × 1–2 mm, lanceolate or ovate, caducous. Flowers with sepals homomorphic or subhomomorphic, ovate or elliptic; central-adaxial petal 2.6–3.2 × 1.8–2.2 cm, obovate-orbicular, two lateral-adaxial petals 2.6–3.2 × 1.8–2 cm, obovate-orbicular, two abaxial petals 2.6–3.2 × 1.8–2 cm, obovate-orbicular; four median stamens with the filaments ca. 1.2–2.2 mm long and anthers 6–9.5 mm long, three abaxial stamens with filaments 3–5 mm long and anthers 6–10 mm long (the central-abaxial anther 3–5 mm long in *S. bacillaris* var. *benthamiana*); ovary sericeous, style sericeous or glabrescent, stigma 0.4–0.6 mm diam. Fruit with stipe 4–10 mm long, body 15–30 × 1–1.2 cm, cylindrical, valves smooth or slightly venulose.

**Distribution & Habitat.** *Senna bacillaris* ranges from southern Nicaragua to northern South America (Irwin & Barneby, 1982).

**Phenology.** In Brazil, flowering from November to July and fruiting from April to July and in November.

**Notes.** *Senna bacillaris* can be recognized by the fractiflex young branches and inflorescence, asymmetric leaflet base (and additionally strongly rounded-truncate base in the proximal pair of leaflets), lamina with conspicuous reticulate venation, uniporate abaxial anthers, and mature fruits with a thickened margin. It can be distinguished from *S. affinis* by the base of proximal leaflets strongly rounded-truncate (vs. obtuse or slightly rounded base in *S. affinis*), the central-adaxial petal 2.5–3.2 × 1.8–2.2 cm (vs. 1.4–2 × 0.7–1.2 cm), and the abaxial anthers uniporate (vs. biporate).

The collections Quelch & McConnell 23 (K) and Maguire & Maguire 40,312 (NY) from Mount Roraima are unusual in the leaflets with more prominent reticulate venation and the stipules dilated and persistent. These collections correspond to *Cassia insignis*, described by Brown (1901) and later synonymized under *S. bacillaris* by Irwin and Barneby (1982). More collections are needed to resolve the placement of these specimens.

Irwin and Barneby (1982) recognized two varieties of *Senna bacillaris*; both occur in Brazil.



## Key to the Brazilian Varieties of *Senna bacillaris*

1. Abaxial anthers of equal length.....14a. *S. bacillaris* var. *bacillaris*.  
 1. Central-abaxial anther smaller than the lateral-abaxial ones.....14b. *S. bacillaris* var. *benthamiana*.

### 14a. *Senna bacillaris* var. *bacillaris*

**Representative Specimens Examined. BRAZIL. Roraima:** Boa Vista, BR- 174, km 23, along Mucajáf-Caracará, 8 Nov 1977 (fr.), *L. Coradin* et al. 1021 (IAN, INPA); Ilha de Maracá, SEMA Ecological Reserve, Ilha de Maracá, Furo de Maracá, 14 Nov 1987 (fl.), *W. Milliken* 746 (K, NY); Mount Roraima, slopes of Roraima, 1894 (fl.), *J. J. Quelch & McConnell* 23 (K).

**Distribution & Habitat.** *Senna bacillaris* var. *bacillaris* occurs in the state of Roraima, growing at the edge of ombrophilous forest, in terra firme forest, igapó forest, riparian forest, and Amazonian savannas, mostly below 500 m a.s.l., but ascending to 1500 m in Mount Roraima.

**14b. *Senna bacillaris* var. *benthamiana*** (J.F. Macbr.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 114 (1982). *Cassia fruticosa* var. *benthamiana* J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13(3/1): 165 (1943).

**Representative Specimens Examined. BRAZIL. Amazonas:** Igarapé Patrona, lago do Castanho-Mirim, 19 Jun 1973 (fl.), *B. W. P. Albuquerque* et al. 750 (INPA); Barreirinha, rio Auti Paraná, 12 Apr 1970 (fl.), *Byron & J. Lima* 245 (MBM); São Paulo de Olivença, rio Solimões, 24 May 1940 (fl., fr.), *A. Ducke* 1014 (NY); Tabatinga, margem alagada do rio Solimões, 13 Aug 1998 (fl.), *A. Ducke* 1501 (IAN, NY); Cambixé, lago do Inemazinho, 6 May 1962 (fl.), *F. C. Melo s.n.* (INPA, US); Rio Purus opposite Lábrea, 23 Jun 1971 (fr.), *G. T. Prance* et al. 13,491 (NY); Cucuí, estrada de Cucuí ao aeroporto, 30 Oct 1987 (fl.), *W. A. Rodrigues* 10,802 (INPA, NY); Igarapé Grande, lago do Rei, 3 Jun 1964 (fl.), *W. Rodrigues & D. Coelho* 5879 (INPA). **Pará:** Óbidos, 9 Nov 1919 (fr.), *A. Ducke s.n.* (RB). **Rondônia:** Porto Velho, distrito de Jaci-Paraná, fora da parcela 29 (alagada), setor 03 margem esquerda do rio Jaci, 3 Mar 2010 (fl.), *R. F. Nascimento* 5 (CEN, RON); Porto Velho, distrito de Jaci-Paraná, rio Jaci, margem esquerda, 10 Mar 2010 (fl.), *V. X. Silveira* 160 (CEN).

**Distribution & Habitat.** The states of Amazonas, Pará, and Rondônia, growing on clay, rocky and sandy soils at the edge of ombrophilous forest, in terra firme forest, igapó forest, riparian forest, and Amazonian savannas, mostly below 500 m a.s.l.

**15. *Senna affinis*** (Benth.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 123 (1982). *Cassia affinis* Benth., Fl. Bras. 15(2): 98 (1870). Fig. 6.

**Description.** Scandent shrub ca. 1.5–5 m tall; young branches fractiflex, cylindrical or angulate, puberulent, sparsely pubescent or glabrous. Stipules filiform or setaceous. Leaves with petiole 3–9 cm long; rachis 2–5 cm long; rachis extra-floral nectary 1, sessile, ovate; leaf rachis appendage setaceous; leaflet lamina elliptic, ovate or obovate, lamina asymmetric, adaxial surface puberulent, sparsely pubescent or glabrous, abaxial surface tomentose,

tomentulose, puberulent, sparsely pubescent or glabrous, chartaceous, leaflets of the proximal pair 6–12 × 3–7 cm, leaflets of the distal pair 8–20 × 4–9 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves shorter than the racemes; bracts 1–4 × 1–2 mm, lanceolate or ovate, caducous. Flowers with sepals heteromorphic, ovate or elliptic; central-adaxial petal 1.5–2 × 0.5–0.9 cm, obovate or oblong, two lateral-adaxial petals 1.5–2 × 0.5–0.9 cm, obovate or oblong, two abaxial petals 1.5–2 × 0.5–0.9 cm, obovate or oblong; four median stamens with the filaments 1.5–3 mm long and anthers 5–8 mm long, three abaxial stamens with filaments 2.5–5 mm long and anthers 5–10 mm long; ovary sericeous, style sericeous or glabrescent, stigma 0.5–0.8 mm diam. Fruit with stipe 5–10 mm long, body 15–25 × 1 cm, cylindrical, valves smooth.

**Representative Specimens Examined. BRAZIL. Bahia:** Mun. Boa Nova, Parque Nacional de Boa Nova, Recanto dos Pássaros, 15 Mar 2014 (fl.), *D. N. Carvalho* 412 (HUEFS); Mun. Porto Seguro, 15 Apr 1965 (fl.), *R. P. Belém & M. Magalhães* 852 (NY); Mun. Itacaré, *R. P. Belém & R. S. Pinheiro* 2190 (CEPEC, NY); Nova Viçosa, 10 Apr 1984 (fl.), *G. Hatschbach* 47,795 (MBM); Mun. Una Rod. BA- 001, 8–10 km da Una, 12 Apr 1992 (fl.), *G. Hatschbach* et al. 57,029 (MBM); Maracás, BA 250, entre Maracás e Contendas do Sincorá, a 13–15 km ao W de Maracás, 26 Apr 1978 (fl.), *S. A. Mori* et al. 9977 (CEPEC, NY); Mun. Ilhéus, Banco Central. Faz. S. José, 19 Apr 1971 (fl.), *R. S. Pinheiro* 1189 (CEPEC, NY); Laje, Fazenda Sete Voltas, 24 Apr 2018 (fl.), *T. T. Silva* 253 (HUEFS, HURB). **Espírito Santo:** Mun. Cariacica, estrada do entorno da reserva em acesso a Alegre, 11 Apr 2009 (fl.), *A. M. Amorim* et al. 7840 (CEPEC, MBML, RB, UPCB); Mun. Santa Leopoldina, Colina Verde (Morro do Agudo), prop.: Israel Elias Ramos (trilha acima do bananal), 30 May 2007 (fr.), *V. Demuner* 4098 (HUEFS, MBML); Água Doce do Norte, Pedra das Torres, 12 Mar 2003 (fl.), *R. C. Forzza* et al. 5817 (HUEFS, K, MBML, RB); Mun. Conceição da Barra, APA Conceição da Barra ponto de amostragem 2, 26 May 2019 (fl.), *A. D. Firmino* et al. 994 (VIES); Fundão, Goiapaba-Açu, 17 Jun 1998 (fr.), *L. Kollmann & E. Bausen* 122 (ESA, MBML); Mun. Santa Teresa, estrada 25 de julho, terr. Fracalossi, 29 Mar 2011 (fl.), *L. Kollmann & M. Groppo* 12,249 (MBML); Mun. Santa Teresa, estação biológica de Santa Lúcia, próxima ao rio Timbui, 19 Mar 2019 (fl.), *A. Lima* et al. 431 (ESA); Mun. Santa Teresa, Reserva Biológica Augusto Ruschi—Nova Lombardia, 14 Ago 2008 (fr.), *J. Rossini* et al. 434 (MBML, UEC); Mun. Aracruz, Aricanga, 04 Mar 2018 (fl.), *T. F. Sagrillo* 276 (MBML); Vila Velha, Parque Natural Municipal de Jacarenema, 12 Jun 2013 (fr.), *L. A. Silva* 360 (VIES); Linhares, Pontal do Ipiranga, 20 Jun 1996 (fr.), *R. L. D. Souza & A. M. Assis* 49 (VIES); Mun. Iúna, Serra do Valentim., 25 Feb 2014 (fl.), *J. P. F. Zorzanelli* 958 (VIES). **Goiás:** Formosa, fazenda Sucupira, proximidade do povoado de Barreiro, 14 May 2017 (fr.), *P. H. A. Melo & J. A. Lombardi* 6865 (HRCB, HUEFS). **Minas Gerais:** Mun. Viçosa, State Agricultural School, Viçosa, 18 Feb 1959 (fl.), *H. S. Irwin* 2655 (NY); Serra do Cabral, middle slopes of Serra do Cabral, ca. 2 km W of Cantoni, 08 Mar 1970 (fl.), *H. S. Irwin* et al. 27,187 (NY); Marliéria, Parque Estadual do Rio Doce, entrada do alojamento, trilha para Porto Capim, 30 Mar 1996 (fl.), *J. A. Lombardi* 1213 (HRCB, NY); Arcos, Fazenda Faroeste, margem direita do Rio São Miguel, 08 Mar 2003 (fl.), *P. H. A. Melo* 476 (HRCB, HUEFS); Prudente de Moraes, Maciço Escrivânia, 02 Jun 2015 (fr.), *P. H. A. Melo* 4492 (HRCB, HUEFS); Mun. Santa Rita do Sapucaí, Serra da Bela Vista, 20 Feb 2011 (fl.), *O. S. Ribas* 1315 (MBM). **Rio de Janeiro:** Rio de Janeiro, Estrada da Vista Chinesa, pr. a Estação Biológica, 17 Apr 1964 (fr.), *C. Angeli* 370 (NY); Nova

Iguaçu, Estrada da Boa Esperança, 26 Apr 2002 (fr.), *M. G. Bovini 2186* (RB); Cabo Frio, Praias das Conchas, 31 May 1992 (fr.), *J. M. A. Braga 17* (RB, VIC); Angra dos Reis, Fazenda Japubyba, 19 Mar 1951 (fl.), *M. Kuhlmann 2622* (MBM); Rio de Janeiro, restinga da Tijuca, 13 Apr 1945 (fr.), *O. X. B. Machado 617* (NY, RB); Teresópolis, Fazenda de Bom Fim, 12 Jan 1941 (fl.), *H. P. Vellozo 185* (NY). **São Paulo:** São Sebastião, 26 Mar 1892 (fl., fr.), *Edwall 1730* (SP).

**Distribution & Habitat.** *Senna affinis* is restricted to Brazil occurring in Espírito Santo, Bahia, Goiás, Minas Gerais, Rio de Janeiro and São Paulo (northern coast), in the Atlantic Forest and Cerrado domains. The occurrence of *S. affinis* in Goiás based on a single collection remained doubtful until our recent fieldwork to confirm its occurrence in the riparian forests near the municipalities of Formosa and Pirenópolis. It can be found mainly at the edge of ombrophilous forest, in seasonal forest, restinga, dunes, riparian forest and on rocky outcrops, from sea level up to 1300 m a.s.l.

**Phenology.** Flowering from August to May and fruiting from April to September.

**Notes.** This scandent shrub can be recognized by its fractiflex (zig-zagged) branches, ovate extra-floral nectary between the proximal pair of leaflets, asymmetric leaflets, pale yellow flowers, zygomorphic to slightly asymmetric corolla, the petals 1.5–2 cm long, and the green fruit (even when mature) with smooth valves. It can be distinguished from *S. georgica* by the asymmetric leaflet lamina (vs. symmetric in *S. georgica*), the petals 1.5–2 × 0.5–0.9 cm (vs. 3–4.5 × 2.2–3 cm), and cylindrical fruits (vs. laterally compressed).

**16. *Senna chrysocarpa*** (Desv.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 171 (1982). *Cassia chrysocarpa* Desv., J. Bot. Agric. 3: 72 (1814). Fig. 7.

**Description.** Scandent shrub 1–6 m tall; young branches straight or curved, angulate, velutinous, tomentulose or glabrescent. Stipules filiform or setaceous. Leaves with petiole 1.5–2.5 cm long; rachis 0.5–1 cm long; extra-floral nectary 1, sessile or stipitate, lanceolate or fusiform; leaf rachis appendage setaceous; leaflet lamina elliptic or kidney-shaped, asymmetric, adaxial surface pubescent or sparsely pubescent, abaxial surface tomentose or tomentulose, chartaceous, leaflets of the proximal pair 1.8–4 × 2.5–6 cm, leaflets of the distal pair 2–6 × 1.2–3.5 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves usually shorter than the racemes; bracts 1–3 × 1–2 mm, lanceolate or ovate, caducous. **Flowers** with sepals heteromorphic, ovate, obovate or orbicular; central-adaxial petal 1.7–2.2 × 1.4–1.8 cm, obovate, two lateral-adaxial petals 1.7–2.2 × 1.4–1.8 cm, obovate, two abaxial petals 1.8–3 × 1.3–1.5 cm, one obovate and the other cucullate; four median stamens with the filaments ca. 1.6–2.5 mm long and anthers 4.5–6.6 mm

long, three abaxial stamens with filaments 2.5–5 mm long and anthers 4–6 mm long; ovary sericeous, style glabrous, stigma 0.2–0.4 mm diam. Fruit with stipe 4–8 mm long, body 4–8 × 1–1.5 cm, cylindrical, valves smooth or slightly venulose.

**Representative Specimens Examined.** **BRAZIL.** **Alagoas:** Maceió, fazenda Santa Luzia próximo a riacho Doce, 30 Oct 1979 (fl., fr.), *R. P. Lira 9* (NY); Rio Largo, área de influência do Pratagy, 11 Nov 1999 (fl.), *R. P. Lyra-Lemos et al. 4400* (ESA, MAC); 7 Nov 2002 (fl., fr.), *R. P. Lyra-Lemos et al. 7080* (ALCB, MAC); Murici, fazenda Bananeiras, 20 Nov 2012 (fl., fr.), *M. C. S. Mota & E. O. Chagas 11,819* (RB). **Amazonas:** Urucará, São Sebastião, 5 Sep 1968 (fl.), *M. G. Silva 1821* (NY). **Amapá:** Marica, about 1.5 km from confluence with Oiapoque (córrego Crandiutú), 6 Sep 1960 (fl.), *H. S. Irwin et al. s.n.* (NY); Rio Oiapoque, near cachoeira Utussansain, 9 Sep 1960 (fl., fr.), *H. S. Irwin et al. s.n.* (NY); Calçoene, coastal region, along road to gold mines, km 12, 20 Aug 1962 (fl.), *J. M. Pires & P. B. Cavalcante s.n.* (NY); Macapá, estrada de Santana, Coração, 15 Nov 1979 (fl., fr.), *B. V. Rabelo 179* (NY); Macapá, estrada de Fazendinha-Santana, 1 Jul 1980 (fl.), *B. V. Rabelo 497* (NY); Macapá, margem do rio Araguari, arredores de Porto Grande, 13 Oct 1976 (fr.), *N. A. Rosa & M. Santos 994* (NY). **Bahia:** Conde, fazenda do BU, mata da Maré, 2 Feb 1996 (fl.), *T. Jost & M. C. Ferreira 222* (RB); Entre Rios, road from Imbé to Porto Sauípe, 18 Nov 2010 (fl.), *A. V. Popovkin 803* (HUEFS). **Ceará:** Ubajara, Chapada da Ibiapaba, 31 Oct 1988 (fl.), *A. Fernandes et al. s.n.* (EAC); Ubajara, sítio Murimbeca, entorno parque de Ubajara, 26 Aug 2012 (fl.), *M. I. B. Loiola et al. 1944* (EAC). **Maranhão:** Santa Luzia, BR- 222, entre o porto Pindaré e Açailândia, 4 Aug 1978 (fl., fr.), *A. Fernandes & Matos s.n.* (EAC, HUEFS); Vargem Grande, 8 Dec 1979 (fl.), *P. Martins & E. Nunes s.n.* (EAC, HUEFS). **Pará:** Porto Trombetas, mineração rio do norte, 1991 (fl.), *S. Evandro & O. H. Knowles 337* (INPA); Santarém, laguinho, estrada Palhão, km 35, 23 Nov 1990 (fl., fr.), *O. H. Knowles 1660* (INPA); Primavera, 12 Aug 2013 (fl.), *F. C. A. Lucas 1205* (MFS); Belém, 6 km NW Instituto Agrônômico do Norte, near São Joaquim, 4 Oct 1942 (fl.), *M. B. Silva 136* (IAN); Carajás, serra Norte, 13 Jul 1987 (fl.), *S. M. Silva 1360* (NY); **Pernambuco:** Rio Formoso, Horto Florestal de Salinho, 6 Sep 1954 (fl.), *J. I. A. Falcão et al. 956* (VIC); Rio Formoso, Rebio Salinho, 26 Sep 2002 (fl.), *A. C. Sevilha 2648* (CEN). **Roraima:** Manaus–Venezuela highway BR- 174, estrada Manaus–Boa Vista, 52 km north of Caracará, *W. C. Steward et al. s.n.* (INPA, NY); Manaus–Venezuela highway BR- 174, km 515, along bank of Igarapé, 21 Nov 1977 (fl.), *W. C. Steward et al. s.n.* (INPA, NY). **Sergipe:** Japarutuba, próximo ao fosso CP1234, próximo ao polo de tratamento de resíduos de Jericó, 7 Mar 2013 (fl.), *P. Barbosa & E. Santos 3* (ASE); Estância, nascente 6, 18 Dec 2009 (fl., fr.), *C. Calazans et al. 427* (ASE); Japarutuba, pov. São José, 29 Oct 2007 (fl.), *A. V. Santos & E. Santos 5* (CEN). **Tocantins:** Caseara, praia do Sol, 5 Jul 2007 (fl.), *E. R. Santos & W. F. Santos 1478* (HUTO).

**Distribution & Habitat.** *Senna chrysocarpa* is widespread in Brazil, French Guiana, Guyana, and Suriname (Irwin & Barneby, 1982). In Brazil, it is known from the northeastern (Alagoas, Bahia, Ceará, Maranhão, Pernambuco, and Sergipe) and northern (Amazonas, Amapá, Pará, Roraima, and Tocantins states) regions, in the Amazonian, Atlantic Forest, Caatinga, Cerrado, and Pantanal domains. It occurs in seasonal forest, ombrophilous forest, riparian forest, igapó forest, terra firme forest, Amazonian savannas, coastal forest, dunes, and disturbed areas, below 300 m a.s.l.

**Phenology.** Flowering throughout the year and fruiting from July to December.

**Notes.** *Senna chrysocarpa* can be recognized by its quadrangular young branches, asymmetric, elliptical to kidney-shaped leaflets, the inflorescences and flower buds usually covered by a conspicuous golden indumentum, the racemes

usually densely flowered, the sepals heteromorphic, one of the abaxial petals cucullate, the median and abaxial anthers of equal length or sometimes the latter a little shorter, and the fruit body slightly curved and  $4\text{--}8 \times 1\text{--}1.5$  cm. Many specimens of *S. chrysocarpa* in herbaria have been incorrectly identified as the morphologically similar *S. rizzinii*, a species mostly found in drier environments. It can be distinguished from *S. rizzinii* by the bracts  $1\text{--}3 \times 1\text{--}2$  mm and caducous (vs.  $5\text{--}10 \times 3\text{--}6$  mm and persistent in *S. rizzinii*), one of the abaxial petals cucullate (vs. all abaxial petals obovate), and the style  $2\text{--}3.5$  mm long (vs.  $(4.5\text{--}) 5\text{--}8$  mm long).

**17. *Senna rizzinii*** H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 174–175 (1982). *Cassia granulata* Rizzini, Leandra 4–5: 16 (1974). (Fig. 7.)

**Description.** Erect or scandent shrub  $1\text{--}2$  m tall; young branches straight or slightly fractiflex, cylindrical or slightly angulate, tomentose or strigose. Stipules setaceous or filiform. Leaves with petiole  $1.3\text{--}2.5$  cm long; rachis  $0.5\text{--}1.3$  cm long; extra-floral nectary 1 (–2), stipitate, clavate or fusiform; leaf rachis appendage setaceous; leaflet lamina elliptic, obovate or ovate, lamina asymmetric, adaxial surface tomentulose or glabrescent, abaxial surface tomentose, tomentulose or strigose, chartaceous, leaflets of the proximal pair  $1.5\text{--}3.5 \times 1\text{--}1.8$  cm, leaflets of the distal pair  $2\text{--}5 \times 1\text{--}2.5$  cm. Inflorescences axillary or terminal racemes, the subtending leaves shorter than the racemes or equally long; bracts  $5\text{--}10 \times 2.5\text{--}6$  mm, elliptic or ovate, persistent during and after the anthesis. Flowers with sepals heteromorphic, elliptic, obovate or oblong; central-adaxial petal  $1.5\text{--}2 \times 1\text{--}1.3$  cm, obovate-oblong, two lateral-adaxial petals  $1.5\text{--}2 \times 1\text{--}1.3$  cm, obovate-oblong, two abaxial petals  $1.5\text{--}2 \times 1\text{--}1.1$  cm, obovate; four median stamens with the filaments ca.  $1.2\text{--}2$  mm long and anthers  $5.5\text{--}6$  mm long, three abaxial stamens with filaments  $2.5\text{--}5$  mm long and anthers  $5.5\text{--}7$  mm long; ovary sericeous, style glabrous, stigma  $0.2\text{--}0.4$  mm diam. **Fruit** with stipe  $2\text{--}6$  mm long, body  $4\text{--}8.5 \times 1.4\text{--}2$  cm, cylindrical, valves smooth or slightly venulose.

**Representative Specimens Examined.** **BRAZIL.** **Alagoas:** Mata Grande, serra do Parafuso, no topo da serra, próximo ao Alto do Angico, sítio Favela, 2 Jun 2001 (fl.), R. P. L. Lemos 5659 (UEC); São Miguel, 3 km depois do entroncamento da AL- 101 com AL- 201, 25 Aug 1988 (fl., fr.), M. N. R. Staviski et al. 867 (K, MAC). **Bahia:** Palmeiras, BR- 242, entre Pai Inácio e Palmeiras, 11 Mar 2004 (fl.), A. A. Conceição & B. Marazzi 1126 (HUEFS, SP); Paulo Afonso, Dec 1973 (fl.), A. P. Duarte s.n. [holotype: RFA]; Morro do Chapéu, 27 Aug 2006 (fl.), F. França 5524 (HUEFS); Palmeiras, 9 Jun 1992 (fl.), G. G. Hatschbach et al. 56,927 (NY); Lençóis, Chapada Diamantina, beira de estrada em direção a cidade de Palmeiras, March 2019 (fl., fr.), A. Lima et al. 524 (ESA); Paulo Afonso, BR 110, road from Paulo Afonso to Jeremoabo,  $39\text{--}46$  km S of Paulo Afonso, 7 Jun 1981 (fl., fr.), S. A. Mori et al. 14,236 (NY); Santo Estevão,  $5.3$  km ao N da ponte do Paraguaçu, 17 Mar 2004 (fl.), L. P. Queiroz et al. 9159 (HUEFS). **Ceará:** Aquiras, Barco Preto, 26 Jul 1986 (fl., fr.), A. Fernandes et al. s.n. (EAC); Icarai, Caucaia, 1 Aug 1979 (fl.), E. Matos s.n. (EAC, HUEFS); São Gonçalo do Amarante, Apr 2000 (fl.), H. Magalhães 275 (EAC); Cascavel – Beberibe, 19 Oct 1990 (fl., fr.), E. Nunes et al. 1990 (EAC).

**Paraíba:** Teixeira, pico do Jabre, 18 May 2002 (fl., fr.), M. F. Agra et al. 5905 (HUEFS); Areia, chã do jardim, 13 May 1975 (fl., fr.), V. P. Barbosa 133 (VIC); Teixeira, sopé pico do Jabre, 30 Jun 1979 (fl.), A. Fernandes & Matos s.n. (ASE, HUEFS); Areia, brejo Paraibano, 9 Dec 2011 (fl., fr.), E. Melo 10,742 (HUEFS). **Pernambuco:** Triunfo, 27 Aug 1996 (fl.), A. M. Miranda et al. 2454 (HUEFS); Tacaratu, distrito de Espinheiro, 30 Nov 1996 (fl., fr.), L. B. Oliveira et al. 79 (ICN); Caruaru, peladas, “pedra Cruzeiro de São João”, 27 Aug 2009 (fl.), M. Sobral-Leite et al. 979 (HUEFS). **Rio Grande do Norte:** Pureza, ca.  $7$  km após Bebida Velha, no sentido de Pure, 17 Jul 2006 (fl.), J. E. Araújo et al. 101 (EAC); Martins, serra Martins, 17 Jul 1991 (fl.), M. A. Figueiredo et al. 346 (EAC, HUEFS); Florânia, serra do Cajueiro, na trilha da Braúna, 27 Sep 2008 (fl., fr.), R. C. Oliveira et al. 2296 (ASE). **Sergipe:** Poço Redondo, serra da Guia, 17 Oct 2009 (fl.), S. M. Costa 619 (ASE); Poço Redondo, Serra da Guia, 17 Oct 2009 (fl., fr.), S. M. Costa 659 (ASE).

**Distribution & Habitat.** *Senna rizzinii* is restricted to northeastern Brazil (Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe), in the Caatinga, Cerrado and Atlantic Forest domains. The species can be found mostly in the caatinga, but also at the edge of seasonal forest, in savannas, brejos de altitude, rocky outcrops, coastal dunes and forests (Ceará, Rio Grande do Norte and Paraíba), and disturbed areas, from sea level to  $1300$  m a.s.l.

**Phenology.** Flowering and fruiting throughout the year, but mostly from November to June.

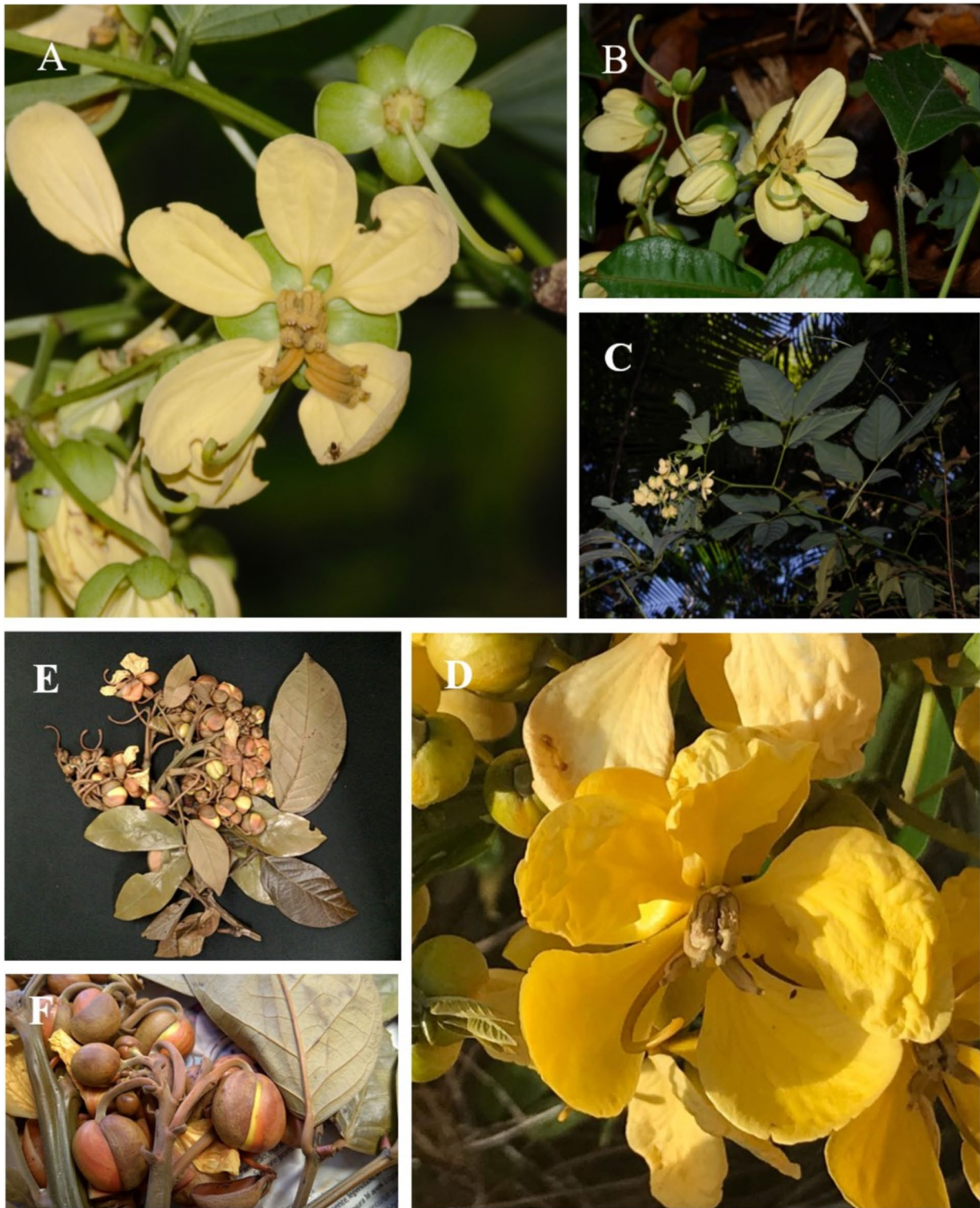
**Notes.** *Senna rizzinii* is a profusely flowering shrub characterized by the bracts elliptic or ovate,  $5\text{--}10 \times 2.5\text{--}6$  mm, persistent during and after anthesis, with several bracts positioned along the inflorescence rachis after the flowers abscise, abaxial stamens up to a third longer than the median ones, and fruit body  $4\text{--}8.5 \times 1.4\text{--}2$  cm.

*Senna rizzinii* morphologically resembles *S. pluribracteata*, the latter a species with very few collections and somewhat morphologically overlapping. *Senna rizzinii* usually has one extra-floral nectary on the leaf rachis (vs.  $1\text{--}2$  in *S. pluribracteata*) and its leaflet adaxial surface tomentulose or glabrescent (vs. strigose). Morphological distinctions between *S. rizzinii* and *S. chrysocarpa* are addressed under the latter.

**18. *Senna pluribracteata*** F.S. Souto & R.T. Queiroz, Syst. Bot 46(2): 353 (2021)

**Description.** Erect shrub ca.  $1$  m tall; young branches straight or slightly fractiflex, cylindrical or slightly angulate, strigose. Stipules filiform. Leaves with petiole  $1.3\text{--}2.5$  cm long; rachis  $0.5\text{--}1.3$  cm long; extra-floral nectary 1 (–2), stipitate, clavate; leaf rachis appendage setaceous; leaflet lamina elliptic, obovate or ovate, lamina asymmetric, adaxial surface strigose, abaxial surface strigose, chartaceous, leaflets of the proximal pair  $1.5\text{--}3.5 \times 1\text{--}1.8$  cm, leaflets of the distal pair  $3\text{--}5 \times 1\text{--}2$  cm. Inflorescences axillary or terminal racemes, the subtending leaves shorter than the racemes or equally long; bracts  $6\text{--}15 \times 2\text{--}5$  mm, elliptic, persistent during and after the anthesis. Flowers with sepals heteromorphic, obovate or oblong; central-adaxial





**Fig. 6** A–C. *Senna affinis*: flowers (A, B); habit (C). D–F. *Senna latifolia*: flower (D); flowering branch (E); flower bud with details of sepals (F). [Credits: Alexandre Gibau de Lima (A–C, E–F), Juliana Kuntz (D).]

petal 1.6–2 × 1–1.3 cm, obovate, two lateral-adaxial petals 1.5–2 × 1–1.3 cm, obovate, two abaxial petals 1.5–2 × 1–1.1 cm, obovate; four median stamens with the

filaments ca. 1.2–2 mm long and anthers 5.5–6 mm long, three abaxial stamens with filaments 2.5–5 mm long and anthers 5.5–7 mm long; ovary sericeous, style glabrous,

stigma 0.2–0.4 mm diam. Fruit with stipe 2–6 mm long, body 4–6 × 1.4–1.8 cm, cylindrical, valves smooth.

**Representative Specimens Examined.** BRAZIL. Paraíba: Sapé, RPPN Fazenda Pacatuba, 26 Jul 2022 (fl.), F. S. Souto et al. 221 (JPB).

**Distribution & Habitat.** *Senna pluribracteata* is endemic to the state of Paraíba in the Atlantic Forest domain. The species occurs in the coastal forests (*tabuleiro costeiro*), below 200 m a.s.l. (Souto et al., 2021).

**Phenology.** Flowering in July and November and fruiting in November (Souto et al., 2021).

**Notes.** *Senna pluribracteata* is a poorly known and recently described species. More collections and molecular studies are required to understand its affinity with other species of *Senna* ser. *Bacillares*. Morphological distinctions between *S. pluribracteata* and *S. rizzinii* are addressed under the latter.

**19. *Senna cornigera*** H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 199–200. 1982.

**Description.** Vine ca. 35 m tall; young branches straight or slightly fractiflex, cylindrical, glabrous. Stipules unknown. Leaves with petiole 0.5–1.5 cm long; rachis 4–5.5 cm long; extra-floral nectary 1, sessile, ovate-linguiform; leaf rachis appendage horn-shaped; leaflet lamina elliptic, lamina subsymmetric, adaxial surface glabrous, abaxial surface sparsely strigose, chartaceous, leaflets of the proximal pair 8–10 × 5–6 cm, leaflets of the distal pair 10–15 × 7–9 cm. Inflorescences axillary raceme or axillary panicle, the subtending leaves shorter than the racemes or equally long; bracts 2–4 × 1–2 mm, elliptic-orbicular or obovate, persistent during anthesis. Flowers with sepals heteromorphic, ovate or orbicular; central-adaxial petal 2.5–2.6 × 2.2–2.3 cm, obovate-orbicular, two lateral-adaxial petals 2.3–2.4 × 2–2.2 cm, obovate-orbicular, two abaxial petals 2.5–3 × 1.5–1.7 cm, one obovate and the other cucullate; four median stamens with the filaments ca. 2.5–3 mm long and anthers 5–7.5 mm long, three abaxial stamens with filaments 4–8 mm long and anthers 13–16 mm long; ovary sericeous, style sericeous, stigma 0.2–0.3 mm diam. Fruit (immature) with stipe ca. 7 mm long, body 18 × 0.5 cm, subcylindrical, valves smooth.

**Representative Specimens Examined.** BRAZIL. Amapá: Monte Dourado, planalto B, rio Jarí, 11 Oct 1968 (fl., fr.), N. T. Silva 1187 (holotype: R; isotypes: IAN, K, NY, US).

**Distribution & Habitat.** *Senna cornigera*, a climbing species, is only known by a single collection from the riparian forest of the Jarí river, in the municipality of Monte Dourado between the states of Amapá and Pará.

**Phenology.** Collected with flowers and immature fruits in October.

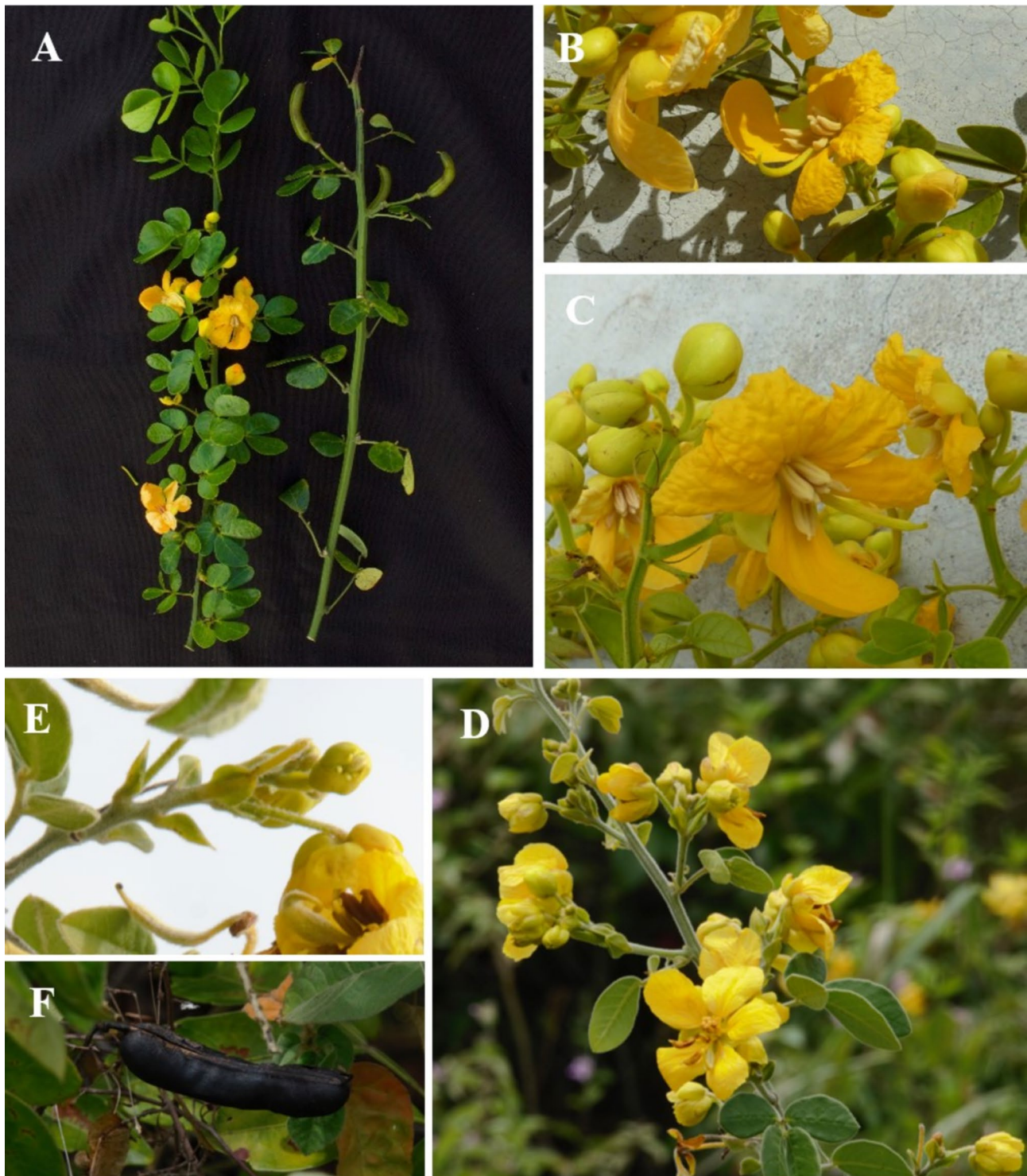
**Notes.** This rare species is remarkable by its horn-shaped appendage at the apex of the leaf rachis, which probably assists its climbing habit. Additionally, *Senna cornigera* can be recognized by its symmetric leaflet lamina and broadly elliptic leaflets, one of the two abaxial petals cucullate, and the sets of stamens strongly differentiated in length.

**20. *Senna gardneri*** (Benth.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 192 (1982). *Cassia gardneri* Benth., Fl. Bras. 15(2): 120 (1870).

**Description.** Erect shrub or treelet ca. 0.5–4 m tall; young branches fractiflex, cylindrical, glabrous. Stipules setaceous. Leaves with petiole 1.2–2.5 cm long; rachis 0.4–0.8 cm long; extra-floral nectary 1, sessile or stipitate, clavate, linguiform or ovate; leaf rachis appendage setaceous; leaflet lamina obovate or orbicular, lamina subsymmetric, adaxial surface glabrous, abaxial surface glabrous, coriaceous, leaflets of the proximal pair 0.8–2 × 0.6–1.2 cm, leaflets of the distal pair 1.8–3.5 × 1.4–2 cm. Inflorescences axillary or terminal racemes, the subtending leaves shorter than the racemes; bracts 1.5 × 0.5 mm, lanceolate, caducous. Flowers with sepals heteromorphic, obovate or oblong; central-adaxial petal 2–2.5 × 1.3–2 cm, oblong-obovate, two lateral-adaxial petals 1.8–2.5 × 1.3–2 cm, oblong-obovate, two abaxial petals 2.2–2.8 × 1.5–1.8 cm, one obovate and the other cucullate; four median stamens with the filaments ca. 2–2.5 mm long and anthers 5–6 mm long, three abaxial stamens with filaments 5–9 mm long and anthers 8–10 mm long; ovary sericeous or glabrescent, style glabrous, stigma 0.2–0.3 mm diam. Fruit with stipe ca. 7 mm long, body 4–8 (–10) × 0.8–1 cm, cylindrical, valves smooth.

**Representative Specimens Examined.** BRAZIL. Bahia: Xique-Xique, km 6 a 8 da estrada que liga Santo Inácio/Gentio do Ouro, margem do rio próximo a ponte, 1 Jun 1991 (fl., fr.), H. S. Brito et al. 317 (NY); Umburanas, Barra dos Alegres, caminho p/Riacho da Barra, caatinga, 28 Jan 2010 (fl.), J. G. Carvalho-Sobrinho et al. 2624 (EAC, HVASF); Brotas de Macaúbas, 2 km de Brotas de Macaúbas, vindo da BR 242, 1 Jun 2007 (fl., fr.), A. A. Conceição et al. 2112 (HUEFS); Oliveira dos Brejinhos, estrada Canabrava a Chapadão de Cima, próximo ao alto da Serra Geral, 16 Mar 1998 (fl.), G. Hatschbach et al. 67,814 (MBM, NY); Bom Jesus da Lapa, Basin of the Upper São Francisco River, Fazenda Imbuizeiro da Onça, ca. 8 km from Bom Jesus da Lapa, on by-road to Calderão, 19 Apr 1980 (fl.), R. M. Harley et al. 21,537 (NY, US); Bom Jesus da Lapa, ca. 10 km na estrada para Ibotirama, 9 Aug 1996 (fr.), J. G. Jardim et al. 923 (ALCB, MBM, NY); Barra, Ba-116, a 18 km de Barra, sentido Ibotirama, caatinga, 4 May 2002 (fl., fr.), T. Jost et al. 544 (ALCB, HUEFS); Cotegipe, fazenda Granflor, 16 Apr 2018 (fl.), T. M. Moraes 1727 (UB); Casa Nova, ca. de 30 km de Remanso para Casa Nova, 16 Jun 2001 (fl., fr.), T. S. Nunes et al. 551 (ALCB, HUEFS); Pilão Arcado, estrada para as Carnaúbas, Lago Grande, caatinga arbórea, 28 Sep 2005 (fl., fr.), L. P. Queiroz et al. 10,948 (HUEFS); Santo Inácio, ramal para cachoeira, 20 Jul 2000 (fl.), M. M. Silva et al. 477 (HUEFS); Casa Nova, estrada para balneário, 28 Oct 2015 (fl.), I. M. Souza et al. 219 (HUEFS). Ceará: Acaraú, Jericoacoara, restinga, 20 Oct 1984 (fl., fr.), A. Fernandes & J. Georgen s.n. (EAC, UFRN); Ibiapina, Serra da Ibiapaba, 4 Nov 1978 (fl., fr.), A. Fernandes & P. Bezerra s.n. (EAC, HUEFS); Novo Oriente, Serra da Ibiapaba, estrada Novo Oriente a São Miguel do Tapuio, 25 Jul 1979 (fl., fr.), A. Fernandes et al. s.n. (EAC, HUEFS); Viçosa do Ceará, próx. inharim, carrasco, 27 Aug 2010 (fl., fr.),





**Fig. 7** A–D. *Senna chrysocarpa*: flowering and fruiting branches (A); flowers (B, C). D–F. *Senna rizzinii*: flowering branch (D); bracts (E); fruit (F). [Credits: Narcísio Bigio (A), Alex Popovkin (B, C), Alexandre Gibau de Lima (D–F).]

*E. Silveira* s.n. (EAC); Cratéus, Serra das Almas, Trilha do Lajeiro, 26 Aug 2004 (fl., fr.), A. A. Soares & J. L. Andrade 37 (EAC). **Maranhão**: Barreirinhas, village of Barreirinhas, 40 km SW along the road to the village of Urbano Santos, 8 Nov 1982 (fl.), G. K. Gottsberger 29–81,182 (NY). **Piauí**: Serra Grande, Parque Nacional da Serra das Confusões, carrasco, 18

Jul 2011 (fl.), A. A. Conceição et al. 4031 (HUEFS); Esperança, corrente, 14 May 1982 (fl., fr.), A. Fernandes & Matos s.n. (EAC); Castelo do Piauí, amostragem lateral à estrada de terra que segue para as torres de transmissão, 27 Jun 2014 (fl.), F. H. F. Nascimento et al. 1326 (HUEFS); Bom Jesus, comunidade Eugenópolis, 1 May 2019 (fl.), L. S. Silva 3 (HDJF).



**Pernambuco:** Petrolina, 3 km ao norte de Petrolina, 9 May 1983 (fl., fr.), *G. Fotius 3454* (HUEFS); Petrolina, 13 Jun 1995 (fl., fr.), *M. M. Silva et al. 25* (HUEFS); Petrolina, quartel do exército, 14 Sep 2006 (fl.), *J. A. Siqueira-Filho et al. 1732* (HUEFS).

**Distribution & Habitat.** *Senna gardneri* is restricted to the Caatinga and Cerrado domains in northeastern Brazil (Bahia, Ceará, Maranhão, Piauí, and Pernambuco). It grows on sandy and rocky soils in the caatinga, carrasco, savannas, and rupestrian grasslands, dunes along the São Francisco River and reaches the restinga vegetation (in Ceará), mostly from 300 to 1000 m a.s.l.

**Phenology.** Flowering throughout the year, but mostly from September to April. Fruiting from April to December.

**Notes.** *Senna gardneri* is a very ornamental shrub. It is readily recognized by fractiflex (zig-zagged) young branches that dry blackish, obovate to orbicular leaflets with craspedodromous secondary venation and a conspicuous marginal vein, and by the abaxial stamens approximately twice the length of the median stamens. It can be distinguished from *S. bahiensis* by the young branches and leaflets nigrescent when dry (vs. young branches gray and leaflets brown when dry in *S. bahiensis*), craspedodromous secondary veins (vs. brochidodromous), and central-adaxial petal 2–2.5 × 1.3–2 cm (vs. 3.3–4 × 2.5–3 cm). Also, the two species apparently do not occur in sympatry, *S. gardneri* preferring drier areas of the Caatinga and Cerrado.

**21. *Senna bahiensis*** A.G. Lima & V.C. Souza, Syst. Bot. 46(3): 828–833 (2021).

**Description.** Scandent shrub or vine ca. 2.5–10 m tall; young branches fractiflex, cylindrical, glabrous. Stipules narrowly lanceolate. Leaves with petiole 1.5–3.5 cm long; rachis 0.3–0.8 (–1) cm long; extra-floral nectary 1, stipitate, clavate; leaf rachis appendage setaceous; leaflet lamina obovate, lamina subsymmetric, adaxial surface glabrous, abaxial surface glabrous, coriaceous, leaflets of the proximal pair 1.6–2.5 × 1.1–1.8 cm, leaflets of the distal pair 2.5–3.6 × 1.5–2 cm. Inflorescences axillary racemes, the subtending leaves shorter than the racemes; bracts 4–6 × 0.8–1 mm, cymbiform, persistent during the anthesis. Flowers with sepals heteromorphic, ovate, obovate or oblong; central-adaxial petal 3.3–4 × 2.5–3 cm, obovate or oblong-obovate, two lateral-adaxial petals 3.3–4 × 2.2–2.8 cm, obovate, two abaxial petals 3.3–4 × 2.2–2.8 cm, one obovate and the other slightly cucullate; four median stamens with the filaments 3–4 mm long and anthers 7–10 mm long, three abaxial stamens with filaments ca. 5 mm long and anthers 12–15 mm long; ovary sparsely sericeous or glabrescent, style glabrescent, stigma 0.2–0.3 mm diam. Fruit unknown.

**Representative Specimens Examined.** **BRAZIL. Bahia:** Santa Terezinha, morro da Pioneira, Serra da Jibóia, topo do morro, 800 m alt., 20

Feb 2022 (st.), *A. Lima et al. 567* (ESA, RB); Santa Terezinha, Serra da Pioneira, 3 km da Pedra Branca, 800 m, 16 May 1984 (fl.), *L.R. Noblick, Lemos & Valdomiro 3217* (CEPEC, HUEFS, US); Castro Alves, Serra da Jibóia, 25 Apr 1994 (fl.), *L.P. Queiroz & N.S. Nascimento 3832* (CEPEC, HUEFS, K, MBM, NY, SP); Ibirapitanga, 22 km N of Itamarati on BR 101, then 6.8 km E on road to Embratel Tower, Reserva Municipal Cachoeira do Pau, Southern Bahian wet forest, 19 Mar 2003 (fl.), *W.W. Thomas et al. 13,447* (holotype: CEPEC; isotypes: HUEFS, RB, SPF).

**Distribution & Habitat.** A rare, endemic species of the Atlantic Forest in Bahia state, known from only three localities. The species occurs at the edge of the ombrophilous forests, climbing to the tree canopy and on rocky outcrops in mountainous areas, ranging from 690 to 800 m a.s.l.

**Phenology.** Collected in flower from March to May.

**Notes.** *Senna bahiensis* is a recently published species being recognized by the leaf rachis with a single extra-floral nectary, the leaflets obovate and symmetric, the petals 3.3–4.5 × 2.5–3.3 cm, and the sets of stamens strongly differentiated in length. Morphological distinctions between *S. bahiensis* and *S. gardneri* are addressed under the latter.

**22. *Senna georgica*** H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 193 (1982). *Cassia hoffmannseggii* var. *gardneriana* Benth. in Fl. Bras. (Martius) 15(2): 104 (1870). Fig. 9.

**Description.** Scandent or erect shrub or treelet ca. 1–6 m tall; young branches fractiflex, cylindrical, glabrous. Stipules narrowly lanceolate or narrowly oblanceolate. Leaves with petiole 3–7.5 cm long; rachis 1.5–5 cm long; extra-floral nectary 1, sessile, globose, lanceolate or ovate; leaf rachis appendage setaceous or filiform; leaflet lamina broadly elliptic, ovate or obovate, lamina symmetric, adaxial surface glabrous, abaxial surface strigose or sparsely pubescent, chartaceous or subcoriaceous, leaflets of the proximal pair 4–12 × 4–8 cm, leaflets of the distal pair 8–22 × 6–10 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves shorter than the racemes; bracts 2–4 × 1–2 mm, lanceolate or ovate, caducous. Flowers with sepals heteromorphic, obovate, ovate or orbicular; central-adaxial petal 3–4 × 2.5–3 cm, obovate, two lateral-adaxial petals 3–4 × 2.2–2.8 cm, obovate or oblong-obovate, two abaxial petals 3–4.5 × 2.2–2.8 cm, one obovate and the other cucullate; four median stamens with the filaments 1.8–3.5 mm long and anthers 5.5–8.8 mm long, three abaxial stamens with filaments 7–12 mm long and anthers 11–15 mm long; ovary sericeous or glabrescent, style sericeous or glabrescent, stigma ca. 0.3 mm diam. **Fruit** with stipe 5–10 mm long, body 15–30 × 0.8–1.2 cm, laterally compressed, valves corrugated.

**Representative Specimens Examined.** **BRAZIL. Alagoas:** São Miguel dos Campos, mata próxima ao campo 123, balneário Tipiricá, 18 Aug 2001 (fl.), *R. P. Lyra-Lemos 5851* (MAC); Ibatiguara, flora dos fragmentos: alto do Guzerá, 16 Dec 2003 (fr.), *M. Oliveira & A. A. Grillo 1517* (HUEFS). **Amazonas:** Rio Guaporé, Jul 1942 (fl.), *C. Sandeman*

2149 (K). **Bahia**: Amaralina, Sep 1948 (fl.), A. X. Moreira s.n. (NY); Entre Rios, fazenda Rio do Negro, 26 Sep 2012 (fl.), A. V. Popovkin & J. C. Mendes 1236 (HUEFS); Entre Rios, fazenda Rio do Negro, 26 Sep 2012 (fl.), A. V. Popovkin & J. C. Mendes 1238 (HUEFS). **Ceará**: Pacatuba, serra da Aratânia, P. & A. J. Castro s.n. (EAC, HUEFS); Baturité, 9 Nov 2016 (fl.), M. L. Guedes et al. 25,239 (ALCB, EAC); Guaramiranga, pico alto, 18 Sep 2007 (fl.), J. R. Lima 163 (EAC); Tianguá, subida da serra, 5 Sep 2012 (fl.), M. I. B. Loliola et al. 1727 (EAC); Guaramiranga, pico alto, 9 Oct 2007 (fl., fr.), E. Silveira et al. s.n. (EAC). **Goiás**: Monte Alegre de Goiás, fazenda Nica, 31 Oct 2000 (fl., fr.), F. C. A. Oliveira et al. 1170 (CEN); Niquelândia, fazenda São João, córrego do Val, 9 Jun 1992 (fl.), B. M. T. Walter et al. 1507 (HUEFS); Uruaçu, fazenda Grotão, margem esquerda do rio Tocantins, 9 Jul 1992 (fl.), B. M. T. Walter et al. 1733 (CEN). **Maranhão**: São Luís, reserva florestal do Sacavém, 3 Jun 1992 (fl.), F. H. Muniz 113 (INPA); Carolina, fazenda Ressaca, 22 May 2010 (fl.), G. Silva-Pereira 15,304 (CEN); Caxias, 28 Nov 2017 (fl., fr.), K. F. Silva 527 (UB); Açailândia, 90 km from Imperatriz, 16 Jul 1987 (fl.), S. Tsugaru & Y. Sano 2472 (NY). **Mato Grosso**: Cáceres, BR-070, 19 May 2013 (fl.), J. E. Q. Farias & M. R. V. Zanatta 3602 (CEN, UB); Pontes e Lacerda, próximo ao córrego Bugres, 16 Aug 1997 (fl.), G. Hatschbach et al. 66,949 (HUEFS, MBM); Novo Horizonte, estrada vicinal, 9 Aug 1997 (fl., fr.), A. G. Nave et al. 1784 (ESA, UEC, UFG); Castanheira, Juína-Juruena, beira da estrada, 8 Jul 1997 (fl.), V. C. Souza et al. 18,369 (ESA). **Pará**: São Francisco do Pará, travessa do 96, 13 Dec 1978 (fl., fr.), M. C. Bastos et al. 139 (NY); Belterra, estrada de Santarém, 7 Oct 1962 (fl., fr.), A. P. Duarte 7229 (NY); Belém, Capoeira do Catu, IPEAN, 8 Sep 1968 (fl.), J. M. Pires 14,827 (NY); Tucuruí, BR-422, rio Caraipé, 4 Nov 1983 (fr.), J. F. Ramos 972 (INPA); Paragominas, Itinga do Pará, 3 Sep 1976 (fl.), M. G. Silva 2746 (NY); Serra Norte, Carajás, rio Itacaiunas, 12 Jul 1987 (fl.), S. M. Silva 1357 (NY). **Paraíba**: Pitimbu, litoral, 26 Oct 1995 (fl., fr.), A. S. F. Castro 48 (EAC); Mamanguape, BR-101, 17 Sep 1979 (fl., fr.), P. Martins et al. s.n. (EAC, HUEFS); Mamanguape, REBIO Guaribas, área II, mata Maranjá, 30 Nov 2002 (fl., fr.), A. C. Sevilha 2585 (CEN); Areia, Escola de Agronomia do Nordeste, 12 Sep 1944 (fl.), J. M. Vasconcelos 641 (SP). **Pernambuco**: São Vicente Ferrer, mata do Estado, 31 Jul 1998 (fl., fr.), E. M. N. Ferraz & A. G. Bispo 361 (NY); Recife, Parque Estadual Dois Irmãos, 15 Sep 2006 (fl.), M. M. Machado s.n. (HST, HUEFS); São Lourenço da Mata, estação ecológica do Tapacurá, 19 Dec 2000 (fl.), E. S. Silva 46 (NY); Goiana, ponta de pedras, área antropizada frente a praia, 26 Nov 2013 (fl., fr.), L. R. Silva 424 (HST, HUEFS). **Piauí**: Esperantina, estrada Volta da Jurema a Esperantina, pequena mata, 31 May 1979 (fl., fr.), A. J. Castro & S. Nunes s.n. (EAC, HUEFS); Teresina, 29 Jul 1979 (fl., fr.), A. Fernandes et al. s.n. (EAC, HUEFS); Tamboril, 20 Jul 1979 (fl.), F. C. Silva 9 (NY). **Tocantins**: Filadélfia, W of Filadélfia in serra de Mamoneira, 2 Aug 1964 (fl., fr.), G. T. Prance et al. 58,516 (NY); Porto Nacional, 27 May 2009 (fl.), C. B. Soares & A. G. Azevedo 1053 (HUTO).

**Distribution & Habitat.** *Senna georgica* is widely distributed in South America, including in Bolivia, Brazil, French Guiana, Guyana, and Paraguay (Irwin & Barneby, 1982). In Brazil, it occurs in the central-western (Mato Grosso and Goiás), northern (Amazonas, Pará, and Tocantins), and north-eastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, and Rio Grande do Norte) regions, in Amazonia, Caatinga, Cerrado, and Atlantic Forest domains. It has been collected in seasonal forest, riparian forest, ombrophilous forest, terra firme forest, on rocky outcrops, and in areas disturbed by human activity, up to 1000 m a.s.l.

**Phenology.** Flowering from April to December and fruiting from June to December.

**Notes.** This species is characterized by the combination of a leaf rachis with only one extra-floral nectary, symmetric leaflet lamina, broadly elliptic to ovate leaflets, the petals  $3\text{--}4.5 \times 2.5\text{--}3$  cm, one of the abaxial petals cucullate, the abaxial stamens approximately twice the length of the median

stamens, and the laterally compressed fruits becoming blackish. Irwin and Barneby (1982) recognized two varieties; only *Senna georgica* var. *georgica* occurs in Brazil.

The species can be distinguished from *S. splendida* by the leaflets 6–10 cm wide (vs. 1.5–3 cm wide), and the fruits laterally compressed (vs. cylindric). Also, it differs from *S. bacillaris* by the symmetric leaflet lamina (vs. asymmetric in *S. bacillaris*), one of the abaxial petals cucullate (vs. obovate-oblong), and the fruits laterally compressed (vs. cylindric). Morphological distinctions between *S. georgica* and *S. affinis* are addressed under the latter.

**23. *Senna splendida*** (Vogel) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 190 (1982). *Cassia splendida* Vogel, Gen. Cass. Syn. 17 (1837). Fig. 8.

**Description.** Scandent or erect shrub ca. 1–8 m tall; young branches slightly fractiflex, subcylindrical, glabrous. Stipules filiform, oblanceolate or rarely obovate, falcate. Leaves with petiole (1.5–) 2–4 (–5) cm long; rachis 1–2 cm long; extra-floral nectary 1, stipitate, clavate or linguiform; leaf rachis appendage filiform or hook shaped; leaflet lamina elliptic, narrowly elliptic, obovate or ovate, lamina symmetric, adaxial and abaxial surfaces glabrous, chartaceous, leaflets of the proximal pair  $2.5\text{--}6 \times 1\text{--}4$  cm, leaflets of the distal pair  $4\text{--}10 \times 1.5\text{--}4.5$  cm. Inflorescences axillary or terminal racemes, the subtending leaves shorter than the racemes; bracts  $2\text{--}5 \times 1\text{--}2$  mm, lanceolate or ovate, caducous or persistent during anthesis. Flowers with sepals heteromorphic, obovate, oblong, orbicular, or ovate; central-adaxial petal  $3.5\text{--}4 \times 2.5\text{--}3.3$  cm, oblong-obovate or orbicular, two lateral-adaxial petals  $3.5\text{--}3.8 \times 2.5\text{--}3$  cm, obovate or oblong-obovate, two abaxial petals  $3.5\text{--}4.5 \times 2.5\text{--}3$  cm, one obovate and the other cucullate; four median stamens with the filaments 3–4 mm long and anthers 7–9 mm long, three abaxial stamens with filaments 10–15 mm long and anthers 14–16 mm long; ovary sericeous, style glabrescent, stigma 0.2–0.5 mm diam. Fruit with stipe 5–15 mm long, body  $15\text{--}40 \times 0.8\text{--}1.1$  cm, cylindrical, valves slightly corrugated.

**Representative Specimens Examined.** **BRAZIL.** **Alagoas:** Piaçabuçu, Jacozinho, cordões litorâneos, 22 Sep 1987 (fl., fr.), M. N. R. Staviski et al. 996 (EAC, ESA). **Bahia:** Marau, litoral sul, fazenda Taipus de Fora, 24 May 2009 (fl.), M. L. Guedes et al. 15,150 (ALCB); Porto Seguro, km 56 da BR-367, 22 Oct 1978 (fl.), S. A. Mori et al. s.n. (NY); Salvador, dunas de Itapuã, arredores da lagoa do Abaeté, 19 Oct 1984 (fl., fr.), L. R. Noblick et al. 3431 (NY); Ilhéus, along road from Ilhéus to Serra Grande, 8 May 1992 (fl.), W. W. Thomas et al. 9229 (NY); Prado, on road from Itamaraju to Cumuruxatiba, 20 Oct 1993 (fl., fr.), W. W. Thomas et al. 10,036 (NY); Prado, reserva florestal da Brasil de Holanda, 20 Oct 1993 (fl.), W. W. Thomas et al. 10,122 (NY, US). **Espírito Santo:** Santa Teresa, Santo Antônio, terreno do Boza, 26 Oct 1999 (fl., fr.), V. Demuner et al. 176 (MBML, RB); Conceição da Barra, REBIO Córrego Grande, 27 Aug 2012 (fl.), T. B. Flores et al. 1208 (ESA, MBML); Linhares, REBIO Sooretama, 17 Jun 1985 (fl.), G. Hatschbach & J. M. Silva 49,441 (MBML, NY); Linhares, Reserva Florestal da Vale do Rio Doce, 16 Oct 1992 (fr.), G. Hatschbach et al. 58,121 (NY); Conceição da Barra, FLONA Rio Preto, 4 Aug 2010 (fl.), J. Rossini et al. 723 (VIES); Conceição da Barra, FLONA Rio Preto, 26 Nov 2019 (fr.), A. F. A. Scheidegger et al. 157 (VIES). **Mato Grosso do Sul:** Anaurilândia, rio Paraná,

a montante da Barragem de Porto Primavera, 17 Oct 1998 (fl.), *A. Amaral* et al. 267 (UEC); Bela Vista, córrego Capei, 17 Mar 1985 (fl.), *G. Hatschbach* et al. 49,181 (NY). **Minas Gerais:** Alfênas, 7 Sep 1987 (fl., fr.), *A. H. Gentry* et al. 59,157 (NY); Ouro Fino, 10 May 1927 (fl.), *F. C. Hoehne* s.n. (SP); Camanducaia, Monte Verde, 26 Apr 2012 (fl.), *L. S. Kinoshita* et al. 1204 (UEC); São João del Rey, Mar 1970 (fl.), *L. Krieger* 8336 (HUFU); Corinto, fazenda do Diamante, base da serra do Angico, 20 Apr 1931 (fl.), *Y. E. J. Mexia* 5674 (NY); Belo Horizonte, Bento Pires, 13 Mar 1945 (fl.), *L. O. Williams* & *V. Assis* 5896 (US). **Paraná:** Jundiá do Sul, 23 Oct 2001 (fl.), *J. Carneiro* 1224 (ESA); Porto Camargo, Parque Nacional de Ilha Grande, Ilha Bandeirantes, 3 Oct 2014 (fl.), *M. G. Caxambu* et al. 5578 (MBM); Mato Rico, Estação Ecológica Municipal Juquiri, 31 Mar 2016 (fl.), *M. G. Caxambu* et al. 7326 (MBM); Rio Branco do Sul, 30 Apr 1967 (fl.), *J. C. Lindeman* 5235 (NY); Jaguariáiva, fazenda Cajuru, source of rio Cajuru, 18 Jan 1965 (fl., fr.), *L. B. Smith* et al. 14,812 (US). **Rio de Janeiro:** Rio de Janeiro, (fl.), *M. Glaziov* 9413 (K). **São Paulo:** Analândia, 21 Mar 1995 (fl.), *M. A. Assis* et al. 514 (ESA); Campos do Jordão, 13 Mar 1985 (fl.), *J. P. M. Carvalho* & *M. J. Robim* 236 (ESA); Piracicaba, mata da fazenda Areão, ESALQ, 13 Jun 1984 (fl., fr.), *E. L. M. Catharino* 99 (ESA); Rio Claro, 15 May 1985 (fl., fr.), *O. Cesar* 421 (ESA); São Paulo, Butantan, 13 Apr 1917 (fl.), *F. C. Hoehne* 36 (NY); São Paulo, 5 Apr 1910 (fl.), *H. Luederwaldt* s.n. (ESA); São Paulo, 5 May 1988 (fl., fr.), *J. A. Pastore* 218 (ESA); Piracicaba, ESALQ, 5 Apr 2000 (fl.), *G. O. Romão* 58 (ESA); Botucatu, fazenda Nossa Senhora da Conceição, SP- 191, cerrado, 9 Jun 1996 (fl.), *V. C. Souza* & *J. P. Souza* 11,443 (ESA, LUSC). **Sergipe:** Santa Luzia do Itanh, RPPN Mata do Crasto, 9 Aug 2011 (fl., fr.), *A. P. Prata* et al. 2712 (NY); Aracaju, Pov. Areia Branca, 17 Jun 1982 (fl.), *M. C. Santana* 107 (ASE).

**Distribution & Habitat.** In Brazil, this taxon occurs in the central-western (Goiás and Mato Grosso do Sul), north-eastern (Bahia and Sergipe), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo), and southern (Paraná) regions, in the Atlantic Forest, Cerrado and Pantanal domains. *Senna splendida* occurs in disturbed areas, at the edge of seasonal forest, in ombrophilous forest, coastal forest, araucaria forest, riparian forest, rupestrian grasslands, and savannas, mostly up to 1300 m a.s.l.

**Phenology.** Flowering and fruiting throughout the year.

**Notes.** This ornamental, scandent shrub is readily recognized by its symmetric, elliptic leaflets, globose flower buds, heteromorphic calyx, obovate, orbicular, or oblong sepals with rounded apex, the petals 3.5–4.5 cm long, one of the abaxial petals cucullate, and the abaxial stamens approximately twice the length of the median stamens.

**24. *Senna gloriosa*** (H.S. Irwin & Barneby) A.G. Lima & Mansano, Nord. J. Bot. 9: 11 (2023). *Senna splendida* var. *gloriosa* H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 192 (1982). Fig. 8.

**Description.** Scandent or erect shrub ca. 1.5–4 m tall; young branches slightly fractiflex, subcylindrical, glabrous. Stipules filiform, oblanceolate or rarely obovate, falcate. Leaves with petiole 1.8–4 cm long; rachis 0.6–2 cm long; extra-floral nectary 1, stipitate, clavate or linguiform; leaf rachis appendage filiform; leaflet lamina elliptic, lamina symmetric, adaxial and abaxial surfaces glabrous, chartaceous, leaflets of the proximal pair 2.5–5.5 × 1–4 cm, leaflets of the distal pair 4–10 × 2–4.5 cm. Inflorescences axillary or terminal racemes, the subtending leaves shorter than the racemes; bracts 4–7 × 2 mm, elliptic, lanceolate or ovate, persistent

during anthesis. Flowers with the sepals homomorphic, lanceolate; central-adaxial petal 3.5–4 × 2.5–3.3 cm, oblong-obovate or orbicular, two lateral-adaxial petals 3.5–3.8 × 2.5–3 cm, obovate or oblong-obovate, two abaxial petals 3.5–4.5 × 2.5–3 cm, one obovate, the other cucullate; four median stamens with the filaments 3–4 mm long and anthers 7–9 mm long, three abaxial stamens with filaments 10–15 mm long and anthers 14–16 mm long; ovary sericeous, style glabrescent, stigma 0.2–0.5 mm diam. Fruit with stipe 5–15 mm long, body 15–45 × 0.8–1.2 cm, cylindrical, valves slightly corrugated.

**Representative Specimens Examined.** **BRAZIL. Alagoas:** Maravilha, 16 Sep 2000 (fl.), *R. P. Lyra-Lemos* 5042 (ESA); Estrela de Alagoas, 18 Jan 2001 (fl.), *R. P. Lyra-Lemos* 5388 (ALCB); Pão de Açúcar, 22 Jun 2002 (fl.), *R. P. Lyra-Lemos* 6894 (ESA). **Bahia:** Caém, Piemonte da Diamantina, 19 Aug 1980 (fr.), *W. N. Fonseca* 241 (ALCB); Abaíra, Chapada Diamantina, 26 Mar 2005 (fl.), *M. L. Guedes* et al. 11,745 (MBM); Xique-xique, 22 Jun 1996 (fl.), *R. M. Harley* et al. s.n. (HUEFS); Caetité, 30 Jun 2003 (fl., fr.), *G. Hatschbach* et al. 75,912 (MBM); Juazeiro, 10 Jun 2007 (fl.), *K. R. S. Mariano* 15 (HUEFS); Seabra, na estrada para Lençóis, 18 May 2002 (fl.), *E. R. Souza* et al. 315 (HUEFS). **Ceará:** Cratêus, RPPN Serra das Almas, 20 May 2002 (fl.), *F. S. Araújo* et al. 1566 (EAC); Viçosa do Ceará, 30 May 1979 (fl., fr.), Fortaleza, campus do Pici, 14 Aug 1987 (fl., fr.), *E. Nunes* & *M. Aparecida* s.n. (EAC); *E. Nunes* & *A. J. Castro* s.n. (EAC); Belmonte, Chapada do Araripe, Crato, 14 Jun 2000 (fl., fr.), *E. Nunes* & *F. S. Cavalcanti* s.n. (HUEFS); Brejo Santo, igreja, 28 Apr 2015 (fl.), *M. Oliveira* 6067 (HUEFS). **Minas Gerais:** Rio Pandeiros, ca. 52 km by road W of Januária near road to Serra das Araras, 21 Apr 1973 (fl.), *W. R. Anderson* 9344 (NY); Itacarambi, rio São Francisco, 19 Jun 2004 (fl.), *G. Hatschbach* et al. 78,008 (MBM); Januária, distrito de Fabiao, 23 May 1997 (fl.), *J. A. Lombardi* 1645 (NY). **Pernambuco:** Mataraca, Millennium Inorganic Chemicals Mineração, 20 Oct 2011 (fl., fr.), *P. C. Gadelha-Neto* et al. 3091 (HUEFS); São José dos Cordeiros, RPPN Fazenda Almas, 22 Jun 2005 (fl.), *A. V. Lacerda* 479 (HUEFS); Areia, Escola de Agronomia do Nordeste, 15 Sep 1953 (fl.), *J. C. Moraes* 888 (NY). **Piauí:** Ouricuri, BR- 122, 22 May 1980 (fl.), *L. Coradin* 2497 (CEN); Mirandiba, sítio Chacal, 19 Apr 2007 (fl.), *E. Córdula* 271 (HUEFS); Buíque, trilha dos Torres, Parque Nacional do Catimbau, 27 Jun 2007 (fl.), *R. M. Santos* 1563 (HUEFS); Bezerros, Parque Ecológico de Serra Negra, 27 Dec 1995 (fl., fr.), *M. C. Tschá* 448 (NY). **Piauí:** Castelo do Piauí, perto da divisa PI-CE, caminho dos Tucuns, 11 Jun 1979 (fl., fr.), *E. Nunes* & *A. J. Castro* s.n. (EAC, HUEFS). **Rio Grande do Norte:** Natal, campus da UFRN, 11 Oct 1999 (fl., fr.), *M. Gimenes* s.n. (HUEFS); Nísia Floresta, distrito de Imuna, fragmento de Mata Atlântica, 27 Aug 2011 (fl.), *E. O. Moura* 26 (HUEFS); Serrinha, Luís Gomes, 16 Jun 1980 (fl.), *O. F. Oliveira* et al. 1064 (ASE). **Sergipe:** Nossa Senhora da Glória, 6 Aug 1982 (fl., fr.), *E. Gomes* 109 (ASE); Simão Dias, Assentamento Maria Bonita, caatinga, 13 Aug 2010 (fl.), *A. P. Prata* et al. 2430 (ASE).

**Distribution & Habitat.** *Senna gloriosa* occurs in the northeastern (Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe) and southeastern (northern Minas Gerais) regions, in the Caatinga and Cerrado domains, and occasionally in the northeastern Atlantic Forest. It occurs in caatinga, savanna, dry forest, on dunes, in brejos de altitude, seasonal forest and rocky outcrop vegetation, mostly from 100 to 1000 m a.s.l.

**Phenology.** Flowering throughout the year, but mostly from February to June. Fruiting from June to December.

**Notes.** *Senna gloriosa* can be distinguished from *S. splendida* by its lanceolate flower buds (vs. globose in *S. splendida*), and lanceolate sepals that are equal in size (vs. oblong, orbicular, ovate and obovate sepals that are strongly different in size).



**25. *Senna angulata*** (Vogel) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 177 (1982). *Cassia angulata* Vogel, Gen. Cass. Syn. 16 (1837). Fig. 9.

**Description.** Scandent shrub ca. 1–10 m tall; young branches curved, angulate, tomentose, velutinous or glabrescent. Stipules narrowly oblanceolate or setaceous. Leaves with petiole 1.5–4 cm long; rachis 0.4–1.2 cm long; extra-floral nectary 1, sessile or stipitate, ovate, lanceolate or fusiform; leaf rachis appendage filiform; leaflet lamina kidney-shaped, elliptic, obovate or ovate, lamina asymmetric, adaxial surface puberulent or glabrous, abaxial surface tomentose or tomentulose, chartaceous, leaflets of the proximal pair 2–5.5 × 1.5–3 cm, leaflets of the distal pair 4–8.5 × 2–3 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves shorter than the racemes; bracts 6–15 × 3–6 mm, lanceolate or ovate, persistent during and after anthesis. Flowers with sepals heteromorphic, elliptic, obovate, oblong or ovate; central-adaxial petal 3–4 × 2.5–3 cm, oblong-obovate, two lateral-adaxial petals 3–3.8 × 2.5–2.8 cm, obovate, two abaxial petals 3–4.5 × 2.5–2.8 cm, one obovate and the other slightly cucullate; four median stamens with the filaments ca. 2 mm long and anthers 6–9 mm long, three abaxial stamens with filaments 4–6.5 mm long and anthers 10–16 mm long; ovary sericeous, style glabrescent, stigma 0.3–0.5

mm diam. Fruit with stipe 5–15 mm long, body 10–20 × 1–1.5 cm, cylindrical, valves corrugated.

**Distribution & Habitat.** *Senna angulata* is exclusive to the Brazilian Atlantic Forest and Cerrado domains, occurring in the states of Bahia, Espírito Santo, Minas Gerais, Paraná, Rio de Janeiro, Santa Catarina, and São Paulo. It grows in areas disturbed by human activity, at the edge of ombrophilous forest, in seasonal forest, restinga, on rocky outcrops, and in riparian forest, savannas, and rupestrian grasslands, from sea level up to 1800 m a.s.l.

**Phenology.** Flowering throughout the year, but mostly from January to July, fruiting from March to September.

**Notes.** *Senna angulata* is a scandent shrub characterized by angulate branches, the leaf rachis with only one extra-floral nectary, persistent bracts 6–15 × 3–6 mm, petals 3–4.5 cm long, and the abaxial stamens approximately twice the length of the median stamens. Two varieties were recognized by Irwin and Barneby (1982).

It can be distinguished from *S. splendida* by the angulate branches (vs. cylindrical branches in *S. splendida*), the bracts 6–15 × 3–6 mm and persistent during and after the anthesis (vs. 2–5 × 1–2 mm and caducous or persistent during the anthesis). It differs from *S. tenuifolia* by angulate branches (vs. cylindrical in *S. tenuifolia*), the bracts 6–15 × 3–6 mm and persistent after anthesis (vs. 1.5–2 × 1–1.5 and caducous), and the fruit 1–1.5 cm wide (vs. 0.5–0.8 cm wide).

### Key to the Brazilian Varieties of *Senna angulata*

1. Branches and inflorescences golden velutinous.....25a. *S. angulata* var. *angulata*.  
1. Branches and inflorescences whitish tomentose or glabrescent.....25b. *S. angulata* var. *miscadena*.

#### 25a. *Senna angulata* var. *angulata*. Fig. 9.

**Representative Specimens Examined.** **BRAZIL. Minas Gerais:** Ouro Preto, (fl.), P. Clausen 195B (NY); Serra do Espinhaço, middle slopes of Serra da Piedade, ca. 40 km E of Belo Horizonte, BR- 31, 1800 m, 16 Jan 1971 (fl.), H. S. Irwin 30,520 (NY); Belo Horizonte, campus UFMG, próximo a prefeitura, 10 Aug 1995 (fr.), J. A. Lombardi 917 (NY); Belo Horizonte, camelo, 09 Apr 2008 (fl., fr.), J. Ordones et al. s/n (BHZZ, HUEFS); Itabira do Campo, Apr 1892 (fl.), E. Ule 2482 (NY); Belo Horizonte, morro das pedras, 1100 m, 25 Mar 1945 (fl.), L. O. Williams & V. Assis 6489 (F).

**Distribution & Habitat.** This variety is restricted to the central region of Minas Gerais state.

#### 25b. *Senna angulata* var. *miscadena* (Vogel) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 178 (1982). *Cassia angulata* var. *miscadena* Vogel, Gen. Cass. Syn. 16 (1837).

**Representative Specimens Examined.** **BRAZIL. Bahia:** Porto Seguro, fazenda Bom Sossego, 28 May 2005 (fl.), L. P. Almeida et al. 121 (CEN); Belmonte, 30 Jun 1996 (fl.), R. P. Belém & R. S. Pinheiro 2448 (NY); Santa Cruz de Cabralia, estrada velha para Sta. Cruz de Cabralia, entre a Estação Ecológica Pau-Brasil e Sta. Cruz de Cabralia, 17 May 1979 (fl.), S. A. Mori s.n. (CEPEC,

NY); Barrolândia, Estação Experimental "Gregorio Bondar" CEPLAC, 48 km east of BR 101 on road to Belmonte, 12 May 1993 (fl.), W. W. Thomas et al. 9894 (NY). **Espírito Santo:** Guarapari, Parque Estadual Paulo César Vinha, restinga, borda de floresta periodicamente inundável, 09 May 2009 (fl.), A. P. Chagas et al. 42 (VIES); Governador Lindenberg, Morelo, propr.: Fernando Nicolli (mata próximo da sede), 24 Apr 2007 (fl.), V. Demuner et al. 3740 (MBML, RB); Pancas, Serra do Alto Mutum Preto, proximidades da rampa de vôo Livre, 07 Mar 2003 (fl.), C. N. Fraga et al. 972 (ESA, MBML, RB); São Mateus, Reserva Florestal de Sooretama, Lagoa do Macaco, 15 May 1977 (fl., fr.), G. Martinelli 2249 (ICN, RB); Serra, 24 Mar 1998 (fl.), O. J. Pereira et al. 1435 (VIES); Linhares, Reserva Florestal Linhares CVRD, próximo a estrada 134, Talhão 301, 22 Mar 1973 (fl.), J. Spada 229 (NY, RB); Santa Teresa, Reserva Biológica Augusto Ruschi–Nova Lombardia, 11 Mar 2003 (fl., fr.), R. R. Vervloet & E. Bausen 1949 (MBML, RB). **Minas Gerais:** Serra do Caparaó, 30 Apr 1988 (fl.), L. Krieger et al. 126(RB); Alto Caparaó, Parque Nacional do Caparaó; estrada entre alojamento e Vale Verde; Mata de Altitude, 01 Sep 1996 (fr.), V. C. Souza et al. 12,099 (ESA, RB). **Paraná:** Campina Grande do Sul, Serra do Capivari Grande, 20 Mar 1967 (fl.), G. Hatschbach 16,200 (MBM, MO, NY); Bocaiúva do Sul, rio Capivari, 14 Jan 1969 (fl.), G. Hatschbach et al. 20,728 (MBM). **Rio de Janeiro:** Saquarema, praia de itaúnas, restinga arbórea sobre solo arenoso, 25 Apr 1987 (fl., fr.), H. C. Lima & G. P. Lewis 2832 (RB, VIC); Petrópolis, Jacó, trilha do encanamento, Parque Nacional da Serra dos Órgãos, 29 Apr 2008 (fl.), M. Nadruz et al. 2190 (RB); Cabo Frio, Parque Ecológico Municipal do Mico-Leão-Dourado, 07 Apr 2003 (fl.), G. S. Z. Rezende 122 (RB, SPF); Armação dos Búzios, fragmento próximo à praia da Tartaruga, 29 Aug 2004 (fr.), R. D. Ribeiro et al. 319 (RB); Rio de Janeiro, Jacarepaguá, via 9, 05 Sep 1972 (fr.), D. Sucre 9605 (RB); Cabo Frio, 20 Mar 1943 (fl.), J. Vidal s.n.

(NY). **Santa Catarina:** Palhoça, morro do cambirela, 05 Apr 1972 (fl.), *A. Bresolin* 534 (FLOR, US). **São Paulo:** Pariqueira-Açú, estação experimental do instituto agrônômico, floresta atlântica, 18 Apr 1995 (fl.), *N. M. Ivanauskas* 122 (ESA, UEC).

**Distribution & Habitat.** This variety is widely distributed along the coastal plain and in the Atlantic Forest mountains, from Santa Catarina to southern Bahia state.

**26. *Senna tapajozensis*** (Ducke) H.S. Irwin & Barneby, *Mem. New York Bot. Gard.* 35: 175 (1982). *Cassia tapajozensis* Ducke, *Arch. Jard. Bot. Rio de Janeiro* 4: 57–58 (1925).

**Description.** Scandent shrub ca. 1–4 m tall; young branches straight or slightly fractiflex, angulate, tomentose, velutinous or puberulent. Stipules filiform or setaceous, falcate or straight. Leaves with petiole 2.5–5 cm long; rachis 0.4–1.5 cm long; extra-floral nectary 1, sessile, lanceolate or ovate; leaf rachis appendage setaceous; leaflet lamina kidney-shaped, elliptic, ovate or obovate, lamina asymmetric, adaxial surface puberulent or glabrescent, abaxial surface tomentose, tomentulose or pubescent, chartaceous or subcoriaceous, leaflets of the proximal pair 3–6 × 2–3.5 cm, leaflets of the distal pair 4–9.5 × 2.5–6 cm. Inflorescences axillary racemes



**Fig. 8** A–C. *Senna splendida*: flower (A); sepals (B); habit (C). D–F. *Senna gloriosa*: flower (D); flower buds with details of sepals (E); habit (F). [Credits: Alexandre Gibau de Lima (A–F).]



or terminal panicles, the subtending leaves shorter or longer than the racemes; bracts  $2-4 \times 1-2$  mm, elliptic or ovate, caducous. Flowers with sepals heteromorphic, orbicular, obovate or ovate; central-adaxial petal  $3-4 \times 2.5-3$  cm, obovate-flabellate, two lateral-adaxial petals  $3-4 \times 2.5-3$  cm, obovate-flabellate, two abaxial petals  $3-4.5 \times 2.5-2.7$  cm, one obovate and the other slightly cucullate; four median stamens with the filaments  $2-4$  mm long and anthers  $6-10$  mm long, three abaxial stamens with filaments  $5-8.5$  mm long and anthers  $10-13$  mm long; ovary sericeous, style glabrescent, stigma  $0.3-0.5$  mm diam. Fruit with stipe  $5-10$  mm long, body  $15-30 \times 1-1.5$  cm, cylindrical or subcylindrical, valves venulose or smooth.

**Representative Specimens Examined.** **BRAZIL.** **Acre:** Xapuri, Reserva Extrativista Chico Mendes, 4 h from Colocação Pimenteira Vai-Quem-Quer, 20 Apr 1995 (fr.), *N. A. Brilhante* 3 (NY); Rio Branco, Parque Zoológico, bloco 01, 2 Jun 1992 (fl.), *G. Claros & Reginaldo* 96 (INPA); Rio Branco, BR 317 (Estrada Rio Branco-Brasília) approx. 10 km W of km 68, 9 Jun 1991 (fl., fr.), *D. C. Daly* et al. 6929 (INPA, NY). **Amazonas:** Manaus, km 139 da estrada Manaus-Itacoatiara, 11 Jun 1972 (fl.), *O. Pires & J. Lima* 111 (INPA); Margin of Lábrea airstrip Amazonas, rio Purus, rio Ituxi, 28 Jun 1971 (fl., fr.), *G. T. Prance* et al. 13,880 (INPA, NY, US); Rio Ituxi, lake west of Boca do Curuquetê, 11 Jul 1971 (fl., fr.), *G. T. Prance* et al. 14,112 (NY); Carauari, cerca de 3 km Norte da cidade, 13 Jul 1980 (fl.), *A. S. L. Silva* et al. 630 (NY); Humaitá, estrada Humaitá-Lábrea, km 70, 9 Jun 1982 (fl., fr.), *L. O. A. Teixeira* et al. 1036 (INPA, NY); Humaitá, estrada Humaitá-Jacarecanga, entre o km 64 e 70, 14 Jun 1982 (fl., fr.), *L. O. A. Teixeira* et al. 1107 (NY); SWW from Manaus, en route from Cacau Pirera to Manacapuru, along the Rt. AM-070, 6 Aug 1987 (fr.), *S. Tsugaru & Y. Sano* B-746 (NY). **Amapá:** Igarapé do Palha, estrada para Amapá, 20 Jul 1962 (fl., fr.), *J. M. Pires & P. B. Cavalcante* 52,236 (NY, US). **Mato Grosso:** Nova Bandeirantes, estrada para Fazenda Novo Horizonte, floresta ombrófila aberta, relevo suave ondulado, solo tipo podzólico, 30 May 1997 (fl.), *G. F. Árbocz* et al. 3909 (ESA); Cristópolis, rod. MT-339, 18 km de Cristópolis para Tangará da Serra, 25 Oct 1995 (fl.), *G. Hatschbach* et al. 63,880 (NY); São José do Rio Claro, bairro Piracema, contato savana florestada/floresta estacional, relevo suave ondulado, solo do tipo latossolo vermelho-escuro, textura média, 25 Apr 1997 (fl.), *N. M. Ivanauskas* et al. 1933 (ESA); Nova Uiratã, contato floresta ombrófila aberta com floresta estacional, beira de estrada, antropizada, 28 Apr 1997 (fl.), *A. G. Nave* et al. 1320 (ESA). **Pará:** Itaituba, estrada Santarém-Cuiabá, BR 163, km 886 a km 881, Serra do Cachimbo, 4 May 1983 (fl.), *I. L. Amaral* et al. 1137 (NY); Porto Trombetas, Mina Saracá, Mineração Rio do Norte, Porto Trombetas – Mina Saracá, 1997 (fl.), *E. M. Barbosa* et al. 57 (INPA); Oriximiná, mineração Rio do Norte, Porto Trombetas, mina Saracá, adyacências, área de reflorestamento, 18 Jun 1999 (fl., fr.), *I. P. Miranda* et al. 408 (INPA); Marabá, coleta no acampamento azul, 24 May 1982 (fl.), *R. S. Secco* et al. 337 (NY). **Rondônia:** Costa Marques, Chapada dos Parecis, Distrito de Alta Floresta, estrada P-56, km 17, 16 Jun 1984 (fr.), *C. A. Cid* et al. 4573 (INPA, NY); Ariquemes, Mineração Mibrasa, Setor Alto Candeias, km 128, Sudoeste de Ariquemes, 11 May 1982 (fl.), *L. O. A. Teixeira* et al. 327 (NY); Santa Bárbara, rodovia BR 364, km 120, Santa Bárbara, 24 May 1982 (fl.), *L. O. A. Teixeira* et al. 716 (NY).

**Distribution & Habitat.** In Brazil, the species is widespread in the central-western (Mato Grosso) and northern (Acre, Amazonas, Amapá, Mato Grosso, Pará, and Rondônia) regions in the Amazonian and Cerrado domains. It grows on sandy or clay soils in riparian forest, igapó forest, terra firme forest, Amazonian savannas, and disturbed areas, mostly at altitudes below 300 m a.s.l.

**Phenology.** Flowering from October to July and fruiting from May to September.

**Notes.** This scandent shrub is easily recognized by its quadrangular young branches, asymmetric leaflet lamina,

rigid sepals, the sets of stamens strongly differentiated in length, and the fruit body  $15-30$  cm long with smooth or venulose valves. It can be distinguished from *S. angulata* by the bracts  $2-4 \times 1-2$  cm and caducous (vs.  $6-15 \times 3-6$  mm and persistent during and after the anthesis in *S. angulata*). Also, it differs from *S. chrysocarpa* by the central-adaxial petal  $3-4 \times 2.5-3$  cm (vs.  $1.7-2.2 \times 1.4-1.8$  cm in *S. chrysocarpa*), the abaxial and median stamens strongly differentiated in length (vs. not), and the fruit body  $15-30$  cm long (vs.  $4-8$  cm long).

**27. *Senna tenuifolia*** (Vogel) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 179 (1982). *Cassia tenuifolia* Vogel, Gen. Cass. Syn. 16 (1837). Fig. 10.

**Description.** Erect shrub or treelet ca.  $1-2$  (–3) m tall; young branches straight or slightly fractiflex, cylindrical, velutinous or tomentose. Stipules filiform or setaceous. Leaves with petiole  $2-3.5$  cm long; rachis  $1-2$  cm long; extra-floral nectary 1, stipitate, slenderly clavate to fusiform; leaf rachis appendage filiform; leaflet lamina elliptic or ovate, lamina asymmetric, adaxial surface tomentulose or puberulent, abaxial surface tomentose or tomentulose, chartaceous, leaflets of the proximal pair  $3-4 \times 1.5-2.5$  cm, leaflets of the distal pair  $4-9 \times 2-3.5$  cm. Inflorescences axillary racemes, the subtending leaves longer than the racemes or equally long; bracts  $1-3 \times 1-2$  mm, ovate, caducous. Flowers with sepals heteromorphic, elliptic or obovate; central-adaxial petal  $1.8-2.5 \times 1.5-2$  cm, obovate or oblong-obovate, two lateral-adaxial petals  $1.8-2.5 \times 1.5-2$  cm, obovate, two abaxial petals  $1.8-2.5 \times 1.5-2$  cm, one obovate and the other cucullate or just slightly cucullate; four median stamens with the filaments  $2-3$  mm long and anthers  $3.5-4.5$  mm long, three abaxial stamens with filaments  $4-7$  mm long and anthers  $6-8$  mm long; ovary sericeous, style sericeous or glabrescent, stigma  $0.3-0.4$  mm diam. Fruit with stipe  $5-8$  mm long, body  $7-13 \times 0.5-0.8$  cm, cylindrical, valves slightly corrugated.

**Representative Specimens Examined.** **BRAZIL.** **Espírito Santo:** Parque Estadual da Pedra Azul, floresta estacional semidecidual montana em arredores de campo de altitude granítico, 17 Aug 2013 (fl.), *I. A. C. Coutinho & P. M. C. Laurenção* 262 (VIC); Dores do Rio Preto, estrada entre a entrada do Parque Nacional do Caparaó e o centro do município de Pedra Menina, estrada vicinal à direita logo após a primeira ponte, 21 Oct 2012 (fl., fr.), *T. B. Flores* et al. 1391 (ESA, RB); Domingos Martins, Parque Estadual da Pedra Azul, trilha das piscinas, 13 Jul 2005 (fl.), *L. Kollmann & R. L. Kollmann* 8049 (ESA, MBML). **Minas Gerais:** Realeza, arredores, 15 Oct 1983 (fl.), *G. Hatschbach & O. Guimarães* 46,858 (NY); Parque Nacional do Caparaó, acesso à cachoeira bonita, 18 Sep 1988 (fl.), *P. L. Krieger* et al. 213 (CESJ); Teófilo Otoni, margem da estrada, 18 Sep 1959 (fl.), *M. Magalhães* 15,603 (RB); Caparaó, Encosta da Serra do Caparaó, abaixo do Parque Nacional, 24 Oct 1989 (fl., fr.), *J. R. Pirani* et al. 2550 (NY); Serra do Caparaó, próximo ao rio Caparaó, rancho dos Três Barras, 26 Jun 1950 (fl., fr.), *N. Santos & I. Campos* s.n. (NY); Alto Caparaó, entrada entre o alojamento e Vale Verde, mata de altitude, 1 Sep 1996 (fl.), *V. C. Souza* et al. 12,100 (ESA, MBML). **Rio de Janeiro:** Petrópolis, San Antonio, 1874 (fl., fr.), *A. F. M. Glaziou* 7580



(NY); Paraíba do Sul, estrada para Rio das Flores, 2 Aug 2006 (fl., fr.), *J. Iganci* et al. 168 (RB); Engenheiro Paulo de Frontin, Morro Azul, descida de trilha de acesso, 7 Jul 1998 (fl., fr.), *M. C. F. Santos* et al. 178 (RB); Santa Maria Madalena, Parque Estadual do Desengano, trilha da Rifa, lado direito, área dos eucaliptos, 22 Aug 2003 (fl.), *M. C. F. Santos* et al. 1517 (RB); Petrópolis, 1 Apr 1941 (fl.), *O. A. Silva s.n.* (RB).

**Distribution & Habitat.** *Senna tenuifolia* is restricted to the Atlantic Forest domain in southeastern Brazil in the states of Espírito Santo, Minas Gerais, and Rio de Janeiro. It grows in mountainous areas at the edge of ombrophilous forest and in seasonal forest, riparian forest, rocky outcrops and disturbed areas, mostly from 500 to 1500 m a.s.l.

**Phenology.** Flowering from January to October and fruiting from April to October.

**Notes.** *Senna tenuifolia* is a shrub to treelet, morphologically characterized by the velutinous or tomentose branches, leaf rachis with one slenderly clavate to fusiform extra-floral nectary, the axillary racemes immersed in the foliage, and the sets of stamens strongly differentiated in length. It can be distinguished from *S. macranthera* by the inflorescence immersed in the foliage (vs. exserted in *S. macranthera*), the axillary racemes shorter than the subtending leaves or equally long (vs. inflorescence paniculate or the axillary racemes longer than the subtending leaves); the fruits 0.5–0.8 cm wide (vs. 1–1.5 cm wide). Morphological distinctions between *S. tenuifolia* and *S. angulata* are discussed under the latter.

**28. *Senna franciscana*** A.G. Lima & Mansano, Nord. J. Bot. 9: 5 (2023).

**Description.** Erect shrub or treelet ca. 1.5–3 m tall; young branches straight or slightly fractiflex, cylindrical, golden velutinous. Stipules filiform. Leaves with petiole 2–3.5 cm long; rachis 0.6–1.1 cm long; extra-floral nectary 1, sessile, conical; leaf rachis appendage filiform or setaceous; leaflet lamina elliptic, ovate or obovate, asymmetric, adaxial surface tomentose, velutinous or tomentulose, abaxial surface velutinous, coriaceous, leaflets of the proximal pair 1.5–4 × 3–5 cm, leaflets of the distal pair 2.5–4.5 × 2–3 cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves usually shorter than the racemes; bracts 4–5 × 2 mm, elliptic or cymbiform, persistent during anthesis. Flowers with sepals heteromorphic, elliptic, obovate and suborbicular; central-adaxial petal 3–3.5 × 2–2.4 cm, orbicular or obovate, two lateral-adaxial petals 2.8–3 × 2 cm, obovate, two abaxial petals 3–3.1 × 2 cm, one obovate, the other cucullate; four median stamens with the filaments 1.5 mm long and anthers 7–9 mm long, three abaxial stamens with filaments 5–8 mm long and anthers 10–12 mm long; ovary sericeous or velutinous, style glabrescent, stigma 0.3–0.5 mm diam. Fruit with stipe 4–15 mm long, body 5–12 × 1.3–1.8 cm, cylindrical, valves slightly corrugated.

**Representative Specimens Examined. BRAZIL. Bahia:** Ibiraba: Barra: comunidade Paulista, ca. 10 km de Ibiraba, trilha sobre as dunas de areia branca em direção à Ibiraba, vegetação de caatinga, 14 Aug 2017 (fl.), *D. Cardoso* et al. 4189 (HUEFS); Xique-xique: dunas do rio são-francisco, 23 Jun 1996 (fl.), *A.M. Giulietti* et al. 2970 (HUEFS); Casa Nova: próximo a casa nova velha 17 km do entroncamento na estrada Ba 235 para Remanso, que fica 35 km depois de Casa Nova, 27 Apr 2001, *R.M. Harley* et al. 54,327 (HUEFS); ca. 50 km NE de Barra, vegetação sobre dunas arenosas a N das dunas de Ibiraba, 14 Oct 2000 (fl.), *L.P. Queiroz* et al. 6444 (HUEFS); Casa Nova: ca. 17 km sul do entroncamento para cidade velha de Casa Nova na rodovia Casa Nova-Remanso, 01 Sep 2002 (fr.), caatinga sob dunas na margem do rio São Francisco, *L.P. Queiroz* et al. 74,725 (HUEFS); Casa Nova: ca. 17 km S do entrocamento para Casa Nova Velha com a BR, próximo à entrada do Balneário Dunas do Velho Chico, 05 Jul 2007 (fl., fr.), *L.P. Queiroz* et al. 7887 (HUEFS); Barra: Ibiraba, dunas interiores da margem esquerda do médio São Francisco, 02 Jun 2000 (fl.), *A.T.A. Rodarte* 74 (ALCB).

**Distribution & hHabitat.** *Senna franciscana* is endemic to the continental dunes of the São Francisco River, in the Caatinga domain of the state of Bahia. It occurs on dystrophic quartzose dunes covered with shrubby vegetation, approximately 400 m a.s.l.

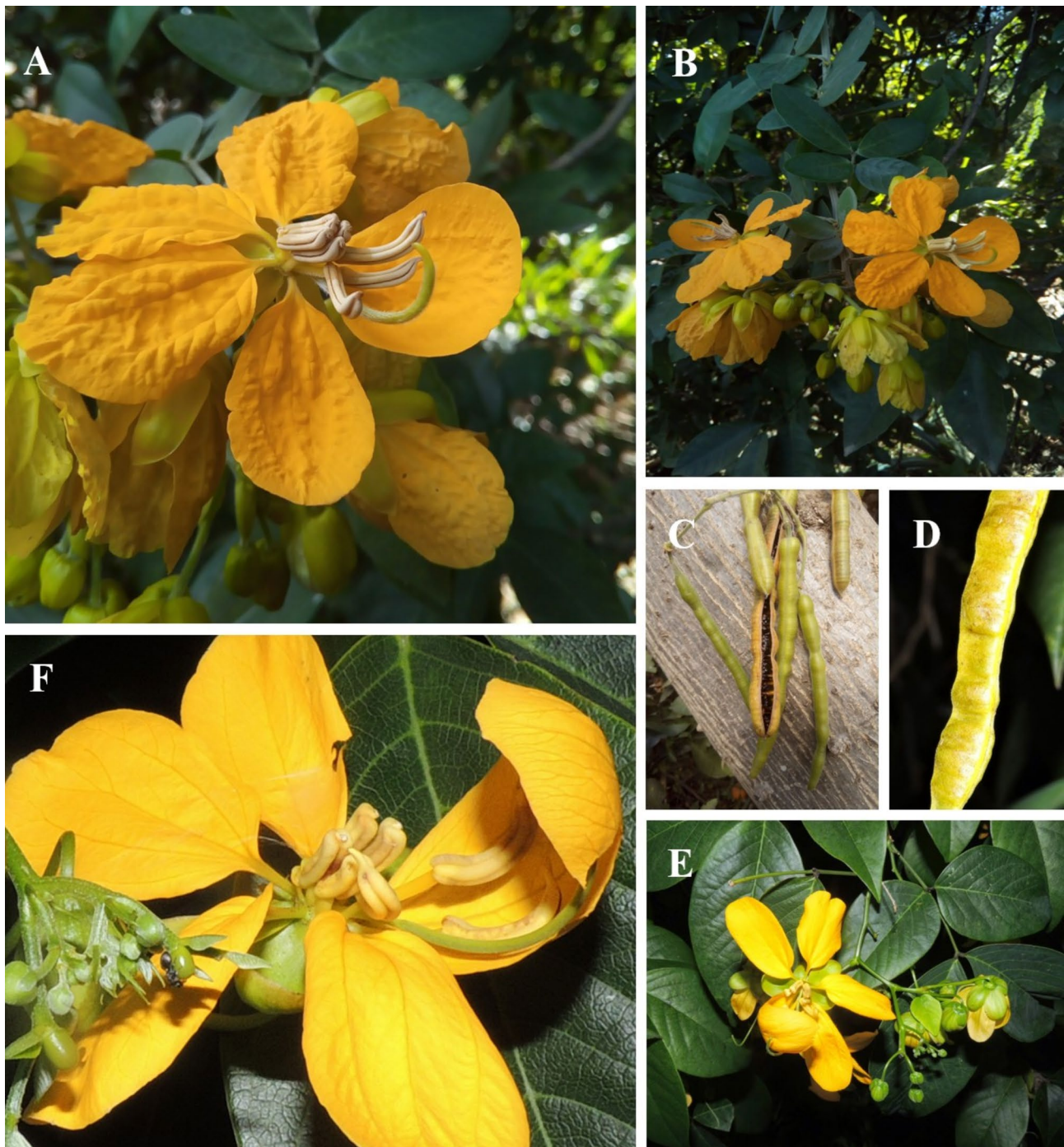
**Phenology.** *Senna franciscana* has been collected in flower from April to August, and in fruit from July to October.

**Notes.** *Senna franciscana* is a recently described species (Lima et al., 2023) characterized by lenticellate, golden velutinous branches, leaflets, bracts, inflorescence, sepals, and fruits, single conical extra-floral nectary on the leaf rachis, coriaceous leaflets, and the sets of stamens strongly differentiated in length.

*Senna franciscana* can be distinguished from *S. rugosa* by its petiole longer than the leaf rachis (vs. shorter in *S. rugosa*) and single extrafloral nectary on the leaf rachis (vs. two). It can be distinguished from *S. macranthera* var. *micans* by its golden velutinous branches, leaflets, inflorescence, buds, sepals and fruits (vs. whitish pubescent or tomentose indumentum in *S. macranthera* var. *micans*). *Senna franciscana* can be distinguished from *S. macranthera* var. *nervosa* by its distal leaflets 2.5–4 (–5) cm long (vs. 6–15 cm long in *S. macranthera* var. *nervosa*), innermost sepals 1–1.3 × 0.5–0.7 cm (vs. 0.3–0.7 × 1.5–0.4 cm), and fruits with valves slightly corrugated, golden velutinous (vs. strongly corrugated, glabrous or pubescent).

**29. *Senna macranthera*** (DC. ex Collad.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 181. (1982). *Cassia macranthera* DC. ex Collad., Hist. Nat. Méd. Casses 99, pl. 8. (1816). Fig. 10.

**Description.** Erect shrub, tree or treelet ca. 1.5–15 m tall; young branches straight or slightly fractiflex, cylindrical, tomentose, tomentulose, velutinous, puberulent sparsely pubescent or glabrous. Stipules filiform or setaceous. Leaves with petiole 1–8 cm long; rachis 1–4.5 cm



**Fig. 9** A–C. *Senna angulata* var. *angulata*: flower (A); habit and flowering branch (B); fruits (C). D–F. *Senna georgica* var. *georgica*: fruit (D); flowering branch and details of leaflets (E); flower (F). [Credits: Franklin Logan (A–C), Rubens Queiroz (D–F).]

long; extra-floral nectary 1 or sometimes a second one positioned between the leaflets of the distal pair or in the tip of the rachis on the abaxial side, sessile or slightly stipitate, ovate, clavate or fusiform; leaf rachis appendage filiform or setaceous; leaflet lamina elliptic, ovate or obovate, asymmetric, adaxial surface tomentose, tomentulose, puberulent, sparsely pubescent or glabrous, abaxial surface tomentose, velutinous,

puberulent, sparsely pubescent or glabrous, chartaceous, leaflets of the proximal pair  $2\text{--}9 \times 1\text{--}4$  cm, leaflets of the distal pair  $2\text{--}15 \times 1\text{--}6$  cm. Inflorescences axillary racemes or terminal panicles, the subtending leaves shorter than the racemes; bracts  $1\text{--}4 \times 1\text{--}2$  mm, lanceolate or ovate, caducous. Flowers with sepals heteromorphic, elliptic, oblanceolate, obovate, ovate or orbicular; central-adaxial petal  $3\text{--}4 \times 1.5\text{--}2.5$



cm, obovate or oblong-obovate, two lateral-adaxial petals 3–4 × 1.5–2 cm, obovate or oblong-obovate, two abaxial petals 3–4 × 1.5–2 cm, one obovate and the other cucullate or just slightly cucullate; four median stamens with the filaments 1.5–3.5 mm long and anthers 4.5–10 mm long, three abaxial stamens with filaments 5–9 mm long and anthers 9–16 mm long; ovary sericeous, style sericeous or glabrescent, stigma 0.5–0.8 mm diam. Fruit with stipe 5–10 mm long, body 6–36 (–38) × 1–1.5 cm, cylindrical, valves smooth or corrugated.

**Distribution & Habitat.** One of the most widespread species of *Senna*, found in different ecosystems in Brazil, Colombia, Ecuador, and Venezuela. The species also is naturalized and cultivated in many other countries (Irwin & Barneby, 1982).

**Phenology.** Flowering and fruiting throughout the year.

**Notes.** *Senna macranthera* can be recognized by its large asymmetric corolla with the petals 2.5–3 cm long, and the sets of stamens strongly differentiated in length (the abaxial stamens approximately twice the length of the median

ones). Morphological distinctions among *S. macranthera*, *S. rugosa* and *S. tenuifolia* are addressed under the last.

Our circumscription of the species conforms to that of Irwin and Barneby (1982), who after analyzing a vast number of specimens, reduced six previously recognized species to varietal status within *S. macranthera*, while also adding two additional varieties within its circumscription. This circumscription of the species encompasses extensive variation in habit, indumentum, and leaflet shape and size, but the morphology of the corolla and androecium is relatively uniform.

Since Irwin and Barneby (1982), new fruiting collections have been deposited in herbaria. These display some differences in fruit morphology across their geographical distribution in Brazil. The varieties associated mainly with Caatinga (varieties. *micans*, *pudibunda* and *striata*) have shorter pods with smooth to slightly corrugated valves. In contrast, the varieties of the Atlantic Forest and Cerrado (varieties. *macranthera* and *nervosa*) have longer fruits with strongly corrugated valves.

## Key to the Brazilian Varieties of *Senna macranthera*

1. Trees or treelets, 3–18 m tall; distal leaflets 6–15 cm long; fruit body (16–) 18–35 (–38) cm long, valves strongly corrugated.....2
1. Shrubs or sometimes treelets, 1–3 (–4) m tall; distal leaflets 2–8 cm long; fruit body 6–16 cm long, valves smooth to slightly corrugated.....3
2. Branches, abaxial face of leaflets and inflorescences velutinous, usually with golden trichomes.....29b. *S. macranthera* var. *nervosa*.
2. Branches, abaxial face of leaflets and inflorescences pubescent to glabrescent. ....29a. *S. macranthera* var. *macranthera*.
3. Branches and abaxial face of leaflets pubescent to glabrescent; fruit body 10–16 cm long. ....29c. *S. macranthera* var. *striata*.
3. Branches and abaxial face of leaflets velutinous; fruit body 6–12 cm long.....0.4
4. Distal leaflets 2–4.5 × 1–2 cm; inner sepals 6.5–14 × 5–8.5 mm.....29 d. *S. macranthera* var. *pudibunda*.
4. Distal leaflets 5–7 × 2–4 cm; inner sepals 3–6 × 2.5–4 mm. ....29e. *S. macranthera* var. *micans*

### 29a. *Senna macranthera* var. *macranthera*

**Representative Specimens Examined. BRAZIL. Espírito Santo:** Santa Teresa, próximo ao Governador, 16 Jul 2003 (fr.), V. Demuner 1589 (MBML); Santa Teresa, Penha, no mato do Tabajara, 22 Mar 2005 (fl.), L. Kollmann et al. 7526 (MBM, MBML). **Bahia:** Wenceslau Guimarães, Reserva Estadual, 1 Apr 1993 (fl.), S. C. Sant'Ana & L. A. M. Silva 321 (CEPEC, NY). **Minas Gerais:** Lima Duarte, Parque Estadual Ibitipoca, 24 Mar 1988 (fl.), P. Andrade et al. 1151 (NY); Viçosa, State Agricultural School, 14 Feb 1959 (fl.), H. S. Irwin 2625 (NY). **Paraná:** Assis Chateaubriand, em direção a Nova Aurora, 15 Apr 2002 (fl.), R. L. C. Bortoluzzi & E. Biondo 1244 (ICN); Campo Mourão, Parque Estadual Lago Azul (PELA), 29 May 2012 (fl.), M. G. Caxambu 1438 (EVB); Cascavel, zoológico municipal de Cascavel, 2 Apr 2011 (fl.), M. C. Scariotto s.n. (EVB). **Rio de Janeiro:** Rio de Janeiro, Vista Chinesa, próximo ao DECAM, 23 Mar 1977 (fl.), D. Araújo 1560 (NY); Nova Friburgo, Reserva Ecológica de Macaé de Cima, 20 Apr 1989 (fl.), H. C. Lima et al. 3552 (MBM, RB); Petrópolis, Itaipava, vale do Sossego, 20 Feb 2004 (fl.), H. C. Lima 6150 (MBM, RB); Petrópolis, Itaipava, vale do Sossego, fragmento de mata de encosta próxima à Rua D., 4 Mar 2007 (fl.), H. C. Lima 6519 (MBM, RB); Cantagalo, (fl.), T. Peckolt 218 (NY); Rio de Janeiro, Vista Chinesa, matas do Distrito Federal, 19 Mar 1940 (fl.), F. F. Silva s.n. (NY). **Santa Catarina:** Araranguá, BR- 101, km 418, 31 Jan 2001 (fl.), R. L. C. Bortoluzzi & S. T. S. Miotto 910 (ICN); Garuva, BR- 101, posto de pesagem ca. 15 km da cidade, 23 Jan 2002 (fl.), R. L. C. Bortoluzzi et al. 1087 (ICN); São Francisco do Sul, Ilha dos Herdeiros, 19 Mar 2005 (fl.), G. Casas 99 (MBM); São Francisco do Sul, Ilha das Flores, 20 May 2004 (fr.), T. Fischer 12 (FURB, MBM); Balneário Camboriú, 17 Jul 2017 (fl.), A. Medeiros s.n. (CRI); Jaraguá do Sul, 27 May 2000 (fl.), A. Sobczak 9

(HUCP); Lages, 25 Apr 2006 (fl.), G. S. Pereira s.n. (LUSC). **São Paulo:** Botucatu, Rubião Junior, Faculdade de Ciências Médicas e Biológicas, Jardim Botânico antigo, no morro, 11 Feb 1969 (fl.), G. K. Gottsberger 11 (NY); São Paulo, Jardim Botânico de São Paulo, 26 Jan 1932 (fl.), F. C. Hoehne 28,778 (NY, SP).

**Distribution & Habitat.** The native range of this variety includes the Atlantic Forest domain and occasionally the Cerrado, occurring in the northeastern (Bahia), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo) and southern (Paraná and Santa Catarina) regions of Brazil. The variety also is cultivated in many Brazilian cities. The few specimens from Rio Grande do Sul are perhaps cultivated, but more collections and field work are required to better understand its occurrence in that state. It grows on clay, rocky, and sandy soils at the edge of ombrophilous forest, and in seasonal forest, riparian forest, and disturbed areas, near the coast, on the Atlantic slopes, and inland, from sea level to 1400 m a.s.l.

**29b. *Senna macranthera* var. *nervosa*** (Vogel) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 184 (1982). *Cassia nervosa* Vogel, Gen. Cass. Syn. 39 (1837). Fig. 10.



### **Representative Specimens Examined. BRAZIL.**

**Bahia:** Porto Seguro, BR- 367, mata higrófila sul bahiana, 9 May 1980 (fl.), A. Euponino 466 (US); Una, REBIO Mico-Leão (IBAMA), 1 May 1996 (fl.), J. G. Jardim 816 (CEPEC, NY); Cruz das Almas, Fazenda Primavera, Nov 1987 (fr.), G. C. P. Pinto s.n. (ALCB); Porto Seguro a Eunápolis, Estação Ecológica do Pau-Brasil, 22 Feb 1984 (fl.), F. S. Santos 279 (CEPEC, NY). **Espírito Santo:** São Gabriel da Palha, faz. Rondelo, 26 Apr 2008 (fl.), A. M. Assis & V. G. Demuner 1558 (MBML); São Roque do Canaã, Alto Misterioso, 2 Dec 2009 (fl.), L. Kollmann et al. 8731 (fl.); Nova Venécia, APA Pedra do Elefante, 25 Jun 2015 (fl.), N. T. L. Pena et al. 163 (VIES). **Federal District:** Brasília, Fundação Zoobotânica, 25 Jan 1962 (fl.), L. Q. Cobra & R. P. Belém 150 (NY); Brasília, gallery at Capão Onça, DF- 13, H. S. Irwin et al. 26,511 (NY). **Goiás:** Cristalina, Serra dos Cristais, 8 Mar 1966 (fl.), H. S. Irwin et al. 13,783 (MBM, NY); Água Fria de Goiás, Serra Geral do Paraná, 17 Mar 1971 (fl.), H. S. Irwin et al. 32,075 (NY); Alto Paraíso de Goiás, rodovia para Colinas do Sul, 23 Feb 1991 (fl.), B. A. S. Pereira et al. 1525 (NY). **Mato Grosso do Sul:** Corumbá, Morraria Santa Cruz, 14 Mar 1990 (fl.), L. F. Boabaid 1 (COR). **Minas Gerais:** Felixlândia, 30 km W of Curvelo, 22 Feb 1975 (fl.), W. R. Anderson 11,522 (NY); Capitólio, região de Furnas, trilha da cachoeira Feixo da Serra, 13 Aug 2007 (fl.), P. H. N. Bernardes et al. 15 (HUFU); Governador Valadares, ca. 10 km of Rio Doce, 28 Mar 1976 (fl.), G. Davidse & W. G. D'Arcy 11,458 (SP); Diamantina, serra do espinhaço, at Lapinha, 23 Feb 1968 (fl.), H. S. Irwin 20,710 (NY). **Paraná:** Campo Mourão, 1978 (fl.), J. M. Lima 490 (US); São Jerônimo da Serra, reserva Indígena, 17 Apr 2002 (fr.), K. L. V. R. Sá 125 (MBM). **Rio de Janeiro:** Itatiaia, vicinity of ponte Maromba, 12 Apr 1929 (fl.), J. Ferreira 2315 (NY); Volta Redonda, Fazenda Santa Cecília do Ingá, 14 Mar 2005 (fl.), H. C. Lima & A. P. Diniz 6262 (MBM, RB). **São Paulo:** Mogi Mirim, fazenda Esmeralda, 19 Mar 1994 (fl.), G. F. Árbocz 240 (UEC); Socorro, 26 Feb 2001 (fl.), M. Groppo 587 (ESA); Vinhedo, rodovia Anhanguera, borda de mata, sítio do Marcel, 5 Apr 2003 (fl.), J. R. Guillaumon s.n. (MBM, SPSF); São Paulo, Parque do Estado, 26 Jan 1932 (fl.), F. C. Hoehne s.n. (NY, SP); Mogi Guaçu, 5 May 1992 (fr.), S. Romaniuc et al. 1308 (ESA).

**Distribution & Habitat.** *Senna macranthera* var. *nervosa* is widely distributed in the Atlantic Forest and in the Cerrado domains, occurring naturally in the central-western (Federal District, Goiás and Mato Grosso do Sul), northeastern (Bahia), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo) and southern (northern Paraná) regions of Brazil. Due to its showy features, it is widely cultivated as an ornamental throughout Brazil and is possibly naturalized in some areas. Across its native range, it occurs in savannas, rupestrian grasslands, riparian forest, seasonal

forest, ombrophilous forest, and in areas disturbed by human activity, from 100 to 1600 m a.s.l.

**29c. *Senna macranthera* var. *striata* (Vogel) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 185–186 (1982). *Cassia striata* Vogel Gen. Cass. Syn. 39–40 (1837).**

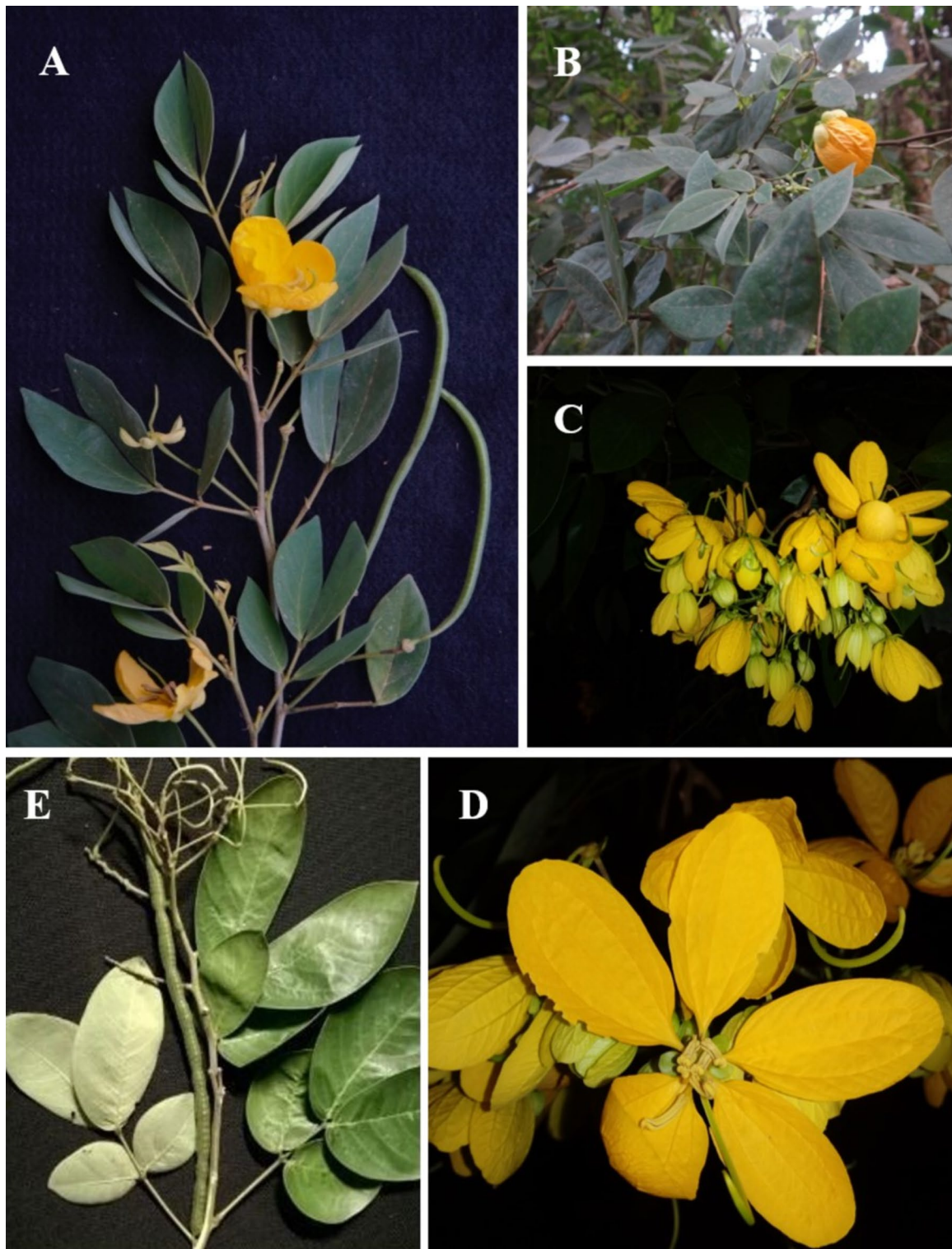
**Representative Specimens Examined. BRAZIL. Bahia:** Serrinha, ca. 12 km south of Village of Araci, 19 Jul 1962 (fl., fr.), G. Eiten et al. 5012 (NY); Jequié, Contendas do Sincorá, 23 Dec 1981 (fl., fr.), G. P. Lewis et al. 976 (K, NY); Jequié, 13 Jul 1979 (fl.), S. A. Mori et al. 12,193 (NY); Cristópolis, BR- 242, 14 Jan 1977 (fl.), G. Hatschbach & O. Guimarães 39,507 (MBM); Vitória da Conquista, BR- 116, 15 Jul 1982 (fl.), G. Hatschbach & O. Guimarães 45,034 (MBM, NY). **Ceará:** Quixadá, fazenda Flamengo, serra Azul, 18 Mar 1993 (fr.), I. M. Andrade s.n. (EAC). **Goiás:** Nova Vista, Posse, 11 Jan 1977 [1977], G. Hatschbach 39,396 (MBM, NY). **Pernambuco:** Russinha, 6 Mar 1935 (fl.), B. J. Pickel 3911 (NY). **Tocantins:** Arraías, rodovia para Campos Belos, 15 Feb 1990 (fl.), G. Hatschbach et al. 54,027 (MBM, NY).

**Distribution & Habitat.** *Senna macranthera* var. *striata* occurs predominantly in the Caatinga domain, although occasionally it is found in the Atlantic Forest and Cerrado domains. It occurs in the central-western (Goiás), north-eastern (Bahia, Ceará, and Pernambuco), and northern (Tocantins) regions of Brazil. The variety grows mostly in xeric ecosystems, including caatinga, savanna, and on rocky outcrops, mostly from 100 to 500 m a.s.l.

**29d. *Senna macranthera* var. *pudibunda* (Mart. ex Benth.) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 186 (1982). *Cassia pudibunda* Mart. ex Benth., Fl. Bras. 15(2): 102 (1870).**

**Representative Specimens Examined. BRAZIL. Bahia:** Juacema, fazenda pé de serra, 28 Jul 2005 (fl.), D. S. Carneiro-Torres 357 (HUEFS); Aracatu, arredores, 17 May 1983 (fl.), G. Hatschbach 46,381 (MBM, NY); Urandi, BR- 122, 4 Apr 1992 (fl., fr.), G. Hatschbach & E. Barbosa 56,535 (MBM); G. Hatschbach & F. J. Zelma 50,447 (MBM); Lagoa Real, açude, 16 Jan 1997 (fl.), G. Hatschbach et al. 65,835 (MBM, NY); Ibitiara, 17 Jun 1986 (fl., fr.), Morro do Chapéu, ca. 1 km da BR- 122 ao S do entrocamento com a BA- 52, 21 Jun 1993 (fl., fr.), L. P. Queiroz & N. S. Nascimento 3321 (HUEFS, NY); Juazeiro, BR- 407 to Senhor do Bonfim, 24 Jan 1993 (fl., fr.), W. W. Thomas et al. 9629 (MBM, NY). **Ceará:** Cratêus e Novo Oriente, 16 Apr 1980 (fl., fr.), A. Fernandes & E. Nunes s.n. (EAC); Barra, Estação Ecológica de Aiuaíba, serra do Ermo, 26 Feb 1997 (fl.), L. W. Lima-Verde et al. 523 (EAC). **Minas Gerais:** Espinosa, serra próxima à Lagoa da Romana, 1068 m alt., 05 Nov 2002 (fr.), A. O. Araujo et al. 20 (ESA, LUSC). **Paraíba:** Arara, agreste, 17 Mar 1975 (fl.), V. P. Barbosa 217 (RB); Arara, agreste, 17 Mar 1975 (fl.), V. P. Barbosa 234 (RB); Patos, 4 Jul 1955 (fl.), C. R. Gonçalves s.n. (RB). **Pernambuco:** Ibimirim, 19 Jul 1995 (fl., fr.), E. Ferraz & A. Laurênio 261 (NY); Bezerros, Parque Ecológico de Serra Negra, 27 Dec 1995 (fl.), M. J. Hora & M. J. Campelo 9 (NY); Floresta, REBIO Serra Negra, 20 Jul 1995 (fl.), A. Laurênio 93 (NY); Ibimirim, M. J. N. Rodal et al. 603 (NY). **Piauí:** Jacaré, Cocal, 25 Jul 2003 (fl., fr.), E. M. F. Chaves 456 (HUEFS). **Rio Grande do Norte:** Currais Novos, cânion dos apertados, 24 Aug 2017 (fl.), F. F. Pezzini & T. G. C. Menezes 302 (HUEFS).

**Distribution & Habitat.** *Senna macranthera* var. *pudibunda* is widespread in northeastern (Bahia, Ceará, Paraíba, Pernambuco, Piauí, and Rio Grande do Norte) and southeastern (north of Minas Gerais) Brazil, in the Caatinga



**Fig. 10** A, B. *Senna tenuifolia*: flowering and fruiting branch (A); habit (B). C–E. *Senna macranthera* var. *nervosa*: inflorescence (C); flower (D); fruiting branch (E). [Credits: Juliana Kuntz (A), Letícia Rosignoli (B), Alexandre Gibau de Lima (C–E).]



domain and at the limits of this vegetation as it grades into Cerrado. It grows in xeric ecosystems, mostly on sandy soils in caatinga, savanna, and in areas disturbed by human activity, as well as in the São Francisco River dunes, mostly below 500 m a.s.l.

**29e. *Senna macranthera* var. *micans* (Nees) H.S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 185 (1982). *Cassia micans* Nees, Flora 4: 303 (1821).**

**Representative Specimens Examined. BRAZIL. Bahia:** Palmeiras, ca. 3 km da entrada de Lençóis em direção a Seabra, 13 Apr 1990 (fl.), A. M. V. Carvalho & W. W. Thomas 2986 (CEPEC, NY); Santa Inês, ca. 55 km Milagres/Jequie, 15 Apr 1990 (fl.), A. M. V. Carvalho & W. W. Thomas 3100 (CEPEC, NY); Caetité, serra Geral, brejinho das Ametistas, 22 May 2008 (fr.), M. L. Guedes & F. S. Gomes 14,544 (ALCB); Mucugê, caminho para Igatu, 27 Jul 2013 (fr.), M. L. Guedes 20,875 (MBM); Serra do Sincorá, Cascavel on the road to Mucugê, 25 Mar 1980 (fl.), R. M. Harley 20,941 (K, NY); Maracás, 27 Apr 1978 (fl.), S. A. Mori et al. 10,043 (NY). **Ceará:** Barbalha, chapada do Araripe, 17 Jul 2002 (fl.), E. Augusto 1 (EAC); Catuana, 1935 (fl.), B. E. Dahlgren 790 (US); Crato, chapada do Araripe, 29 Feb 1980 (fl.), P. Martins s.n. (EAC). **Maranhão:** São João dos Patos, Bom Jesus, BR- 135, 1 May 1978 (fl.), A. Fernandes & Matos s.n. (EAC); Barra do Corda, 10 Nov 1979 (fl., fr.), E. Nunes & P. Martins s.n. (EAC). **Minas Gerais:** Espinosa, divisa com Montezuma, serra do Pau d'arco, campo rupestre, 1400 m alt., 15 Mar 1994 (fl.), C. M. Sakuragui et al. s.n. (ESA); Santo Antônio do Retiro, sítio 12, ponto 12, cerrado em regeneração, alto da chapada, 16 Mar 2017 (fl., fr.), A. C. Sevilha et al. 6485 (CEN). **Paraíba:** Serra de Teixeira, pico do Jabre, 16 Apr 1993 (fl.), M. F. Agra 1991 (NY); Monteiro, serra de Jabitacá, 12 Jun 2008 (fl.), P. C. Gadelha et al. 2331 (JPB, HUEFS). **Pernambuco:** Pesqueira, serra do Ororobá, 17 May 1995 (fl.), M. Correia 433 (HUEFS); Parnamirim, fazenda Floresta, serra do Rumão, 14 May 2015 (fl., fr.), A. P. Fontana 9375 (HUEFS); Garanhuns, depois da clínica UFRPE, 1 Dec 1996 (fl.), A. M. Miranda 2554 (HST, INPA). **Piauí:** Brasileira, Capão do Mariano, PARNA de Sete Cidades, 12 Jul 2001 (fl.), M. E. Alencar 1382 (HUEFS). **Rio Grande do Norte:** Riachuelo, 60 km W from Natal, 28 Aug 1987 (fl., fr.), S. Tsugaru 1239 (NY). **São Paulo:** Teodoro Sampaio, Parque Estadual do Morro do Diabo, Mata Seca, J. A. Pastore 511 (ESA); Teodoro Sampaio, 14 km de Planalto do Sul em direção a Presidente Epitácio, mata mesófila com *Cereus*, 15 Feb 1996 (fl.), J. P. Souza & V. C. Souza 350 (ESA, LUSC). **Sergipe:** Capela, mata do Junco, 16 Aug 2012 (fl., fr.), L. A. Gomes et al. 643 (ASE); Lagarto, povoado Colônia 13, 15 Jul 2008 (fl.), C. S. Santos 211 (ASE).

**Distribution & Habitat.** *Senna macranthera* var. *micans* occurs in northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe) and southeastern (Minas Gerais and São Paulo) Brazil in the Caatinga and Cerrado domains. It occurs on sandy, clay and rocky soils at the edge of seasonal forest, in Caatinga, savanna, rupestrian grasslands, and in disturbed areas, mostly from 300 to 1500 m a.s.l.

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## Literature Cited

- Bachman, S., J. Moat, A.W. Hill, J. de la Torre & B. Scott. 2011. Supporting Red List threat assessments with GeoCAT: Geospatial conservation assessment tool. *ZooKeys* 150: 117–126.
- Barneby, R.C. 1992. Centennial beans: a miscellany of American Fabales. *Brittonia* 44(2): 224–239.
- Bentham, G. 1870. Leguminosae II. Swartzieae et Caesalpinieae. In: C.F.P. Martius & A.G. Eichler (eds.), *Flora Brasiliensis*. vol. 15(2). Frid. Fleischer in comm., Lipzig.
- Bentham, G. 1871. Revision of the genus *Cassia*. *Transactions of the Linnean Society* 27: 503– 591.
- Biondo, E., S.T.S. Miotto, M.T. Schifino-Wittmann & B. Castro. 2005. Cytogenetics and cytotaxonomy of Brazilian species of *Senna* Mill. (Cassieae-Caesalpinioideae-Leguminosae). *Caryologia* 58(2): 152–163. <https://doi.org/10.1080/00087114.2005.10589445>
- Bortoluzzi, R.L.C., A.G. Lima, V.C. Souza, L.G. Rosignoli-Oliveira & A.S. Conceição. 2020. *Senna* in Flora do Brasil 2020 em construção. Jardim Botânico do Rio de Janeiro. <https://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB23149>. Accessed 04 Apr 2024
- Brown, N.E. 1901. *Cassia insignis* N.E. Br. *Transactions of the Linnean Society of London. Botany* 6: 24.
- Bruneau, A., F. Forest, P.S. Herendeen, B.B. Klitgaard & G.P. Lewis. 2001. Phylogenetic relationships in the Caesalpinioideae (Leguminosae) as inferred from chloroplast trnL intron sequences. *Systematic Botany* 26: 487–514.
- Bruneau, A., M. Mercure, G.P. Lewis & P.S. Herendeen. 2008. Phylogenetic patterns and diversification in the caesalpinoid legumes. *Botany* 86(7): 697–718. <https://doi.org/10.1139/B08-058>
- Bruneau, A., L.P. Queiroz, J.J. Ringelberg, L.M. Borges, R.L.C. Bortoluzzi, G.K. Brown, D.B.O.S. Cardoso, R.P. Clark, A.S. Conceição, M.M.T. Cota, E. Demeulenaere, R. Duno de Stefano, J.E. Ebinger, J. Ferm, A. Fonseca-Cortés, E. Gagnon, R. Grether, E. Guerra, E. Haston, P.S. Herendeen, H.M. Hernández, H.C.F. Hopkins, I. Huamantupa-Chuquimaco, C.E. Hughes, S.M. Ickert-Bond, J. Iganci, E.J.M. Koenen, G.P. Lewis, H.C. Lima, A.G. Lima, M. Luckow, B. Marazzi, B.R. Maslin, M. Morales, M.P. Morim, D.J. Murphy, S.A. O'Donnell, F.G. Oliveira, A.C.S. Oliveira, J.G. Rando, P.G. Ribeiro, C.L. Ribeiro, F.S. Santos, D.S. Seigler, G.S. Silva, M.F. Simon, M.V.B. Soares & V. Terra. 2024. Advances in legume systematics 14. Classification of caesalpinioideae. Part 2: Higher-level classification. *PhytoKeys* 240: 1–552. <https://doi.org/10.3897/phytokeys.240.101716>
- De Candolle, A.P. 1825. *Prodromus Systematis Naturalis Regni Vegetabilis*, part 2. Sumptibus Sociorum Treuttel et Würtz, Paris.

- Harris, J.G. & M.W. Harris. 2001. *Plant Identification Terminology: An Illustrated Glossary*, 2nd. ed. Spring Lake Publishing, Spring Lake, Utah.
- Herendeen, P.S., A. Bruneau & G.P. Lewis. 2003. Phylogenetic relationships in caesalpinioideae legumes: a preliminary analysis based on morphological and molecular data. Pp. 37–62 in: B.B. Klitgaard & A. Bruneau (eds.), *Advances in Legume Systematics, Part 10, Higher Level Systematics*, Royal Botanic Gardens, Kew, U.K.
- IPCN. 2022. *Index to Plant Chromosome Numbers*, Missouri Botanical Garden, St. Louis, Missouri. <http://legacy.tropicos.org/project/ipcn> (Accessed: 9 October 2024).
- Irwin, H.S. & B.L. Turner, 1960. Chromosomal relationships and taxonomic considerations in the genus *Cassia*. *American Journal of Botany* 47: 309–318.
- Irwin, H.S. & R.C. Barneby. 1981. Tribe 2. Cassieae Bronn (1822). Pp. 97–106 in: R.M. Polhill & P.H. Raven (eds.), *Advances in Legume Systematics*, part 1. Royal Botanic Gardens, Kew, U.K.
- Irwin, H.S. & R.C. Barneby. 1982. The American Cassiinae. A synoptical revision of Leguminosae tribe Cassieae subtribe Cassiinae in the New World. *Memoirs of the New York Botanical Garden* 35: 1–918.
- IUCN. 2024. *Guidelines for using the IUCN red list categories and criteria*, ver. 16. <https://www.iucnredlist.org/documents/RedListGuidelines.pdf>. Accessed 15 Nov 2024
- LAWG (Leaf Architecture Working Group). 1999. *Manual of Leaf Architecture—morphological description and categorization of dicotyledonous and net-veined monocotyledonous angiosperms*. Leaf Architecture Working Group, Smithsonian Institution, Washington DC.
- Lewis, G., B. Schrire, B. Mackinder & M. Lock. 2005. *Legumes of the World*. Royal Botanic Gardens, Kew, U.K.
- Lima, A.G., L.P. Queiroz, M. Tomazello, G.P. Lewis & V.C. Souza. 2021. A new endangered species of *Senna* (Leguminosae) from the Atlantic Forest of Bahia, Brazil, supported by X-ray analysis of leaflets. *Systematic Botany*. 46(3): 828–833. <https://doi.org/10.1600/036364421X16312067913589>
- Lima, A.G., M. Trovó, C.D. Bacon, L.P. Queiroz, V.C. Souza & V.F. Mansano. 2023. Taxonomic novelties in *Senna* ser. *Bacillares* (Leguminosae). *Nordic Journal of Botany*. <https://doi.org/10.1111/njb.03947>
- Lima A.G., M. Trovó, R.L.C. Bortoluzzi, J.G. Rando, C.D. Bacon & V.F. Mansano. 2024a. Taxonomic revision of *Senna* ser. *Spinescentes* (Leguminosae, Cassieae), including Two New South American Species. *Annals of the Missouri Botanical Garden*. <https://doi.org/10.3417/2024877>
- Lima, A.G., V.F. Mansano, M. Trovó & C.D. Bacon. 2024b. Morphometric and taxonomic studies of *Senna* ser. *Coriaceae* (Leguminosae, Caesalpinioideae, Cassieae), including a new species from Chapada Diamantina, Bahia, Brazil. *Brazil. J. Bot.* <https://doi.org/10.1007/s40415-024-01054-3>
- Linnaeus, C. 1753. *Species Plantarum*, t. 1. Laurentii Salvii, Stockholm.
- Marazzi, B., P.K. Endress, L.P. Queiroz & E. Conti. 2006a. Phylogenetic relationships within *Senna* (Leguminosae, Cassiinae) based on three chloroplast DNA regions: patterns in the evolution of floral symmetry and extrafloral nectaries. *American Journal of Botany* 93: 288–303.
- Marazzi, B., R. Fortunato & P.K. Endress. 2006b. *Senna* (Cassiinae, Leguminosae) in Paraguay: synopsis, conservation, ecological role and ethnobotany. *Candollea* 61(2): 315–329.
- Marazzi, B. & M.J. Sanderson. 2010 Large-scale patterns of diversification in the widespread legume genus *Senna* and the evolutionary role of extrafloral nectaries. *Evolution* 64(12): 3570–3592.
- Miller, P. 1754. *Senna* Mill. *The Gardeners Dictionary*, vol. 3, 4<sup>th</sup> ed, Published by the author, London.
- Nee, M. & R.C. Barneby. 1993. A new species of *Senna* ser. *Bacillares* (Caesalpinioideae, Cassiinae) from Bolivia. *Brittonia* 45: 159–161.
- Randell, B.R. 1988. Revision of the Cassiinae in Australia. 1. *Senna* Miller sect. *Chamaefistula* (Colladon) Irwin and Barneby. *Journal of the Adelaide Botanic Gardens* 11: 19–49.
- Randell, B.R. 1989. Revision of the Cassiinae in Australia. 2. *Senna* Miller sect. *Psilorhagma* (Vogel) Irwin and Barneby. *Journal of the Adelaide Botanic Gardens* 12: 165–272.
- Randell, B.R. 1990. Revision of the Cassiinae in Australia. 3. *Senna* Miller sect. *Senna*. *Journal of the Adelaide Botanic Gardens* 12: 165–272.
- Randell, B.R. & B.A. Barlow. 1998. *Senna*. *Flora of Australia* 12: 89–138.
- Rando, J.G., M. Cota, A.G. Lima, R.L.C. Bortoluzzi & B. Marazzi. 2024. 5. Tribe Cassieae in: A. Bruneau, L.P. Queiroz, J.J. Ringelberg (eds.), *Advances in Legume Systematics 14. Classification of Caesalpinioideae. Part 2: Higher-level Classification. PhytoKeys* 240: 83–102. <https://doi.org/10.3897/phytokeys.240.101716>
- Rojas-Martínez, C., H. Flores & H. Ochoterena. 2019. An outstanding new species of *Senna* (Fabaceae: Caesalpinioideae) from southern Puebla, Mexico. *Phytotaxa* 405(3): 113–120.
- Silverstone-Sopkin, P. 2012. A new combination in *Senna* (Leguminosae, Caesalpinioideae) from the Department of Valle del Cauca, Colombia. *Novon* 22(1): 91–95.
- Singh, V. 2001. *Monograph of Indian Subtribe Cassiinae (Caesalpinioaceae)*. Scientific Editions, Jodhpur.
- Souto, F. S., R.T. Queiroz & M.F. Agra. 2021. *Senna pluribracteata* (Leguminosae, Caesalpinioideae), a new species from Paraíba state, Brazil, with notes on leaf anatomy. *Systematic Botany*. 46(2): 352–360.
- Thiers, B. (continuously updated). *Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff*. New York Botanical Garden, Bronx. Available at: <http://sweetgum.nybg.org/science/ih/>. Accessed Apr 2024
- Vogel, T. 1837. *Generis Cassiae Synopsis*. Published by the author, Berlin.
- Weberling, F. 1989. *Morphology of flowers and inflorescences*. Cambridge University Press, Cambridge. p. 405.

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